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AT

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CONTENTS

PAGE

No. 1.—The Birds of Korea. By Oliver L. Austin, Jr. (Plate.) June, 1948 1

No. 2.—New Guinean Reptiles and Amphibians in the Museum of Comparative Zoölogy and United States National Museum. By Arthur Loveridge. September, 1948 303

No. 3.—The Effect of Light Intensity and Day Length on Reproduction in the English Sparrow. By George A. Bartholomew, Jr. (10 plates.) February, 1949 . . 431

No. 4.—The Nearctic Members of the Genus Lycaeides Hübner (Lycaenidae, Lepidoptera). By V. Nabokov. (9 plates.) February, 1949 477

No. 5.—The Placentation of the Pronghorned Antelope (Antilocapra Americana). By George B. Wislocki and Don W. Fawcett. (3 plates.) March, 1949 . . . 543

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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE
VOL. 101, No. 1

THE BIRDS OF KOREA

BY OLIVER L. AUSTIN, JR.

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AT HARVARD COLLEGE

The Bulletin and Memoirs are devoted to the publication of investigations by the Staff of the Museum or of reports by specialists upon the Museum collections or explorations.

Of the Bulletin, Vols. 1 to 101, No. 1 have appeared and of the Memoirs, Vols. 1 to 55.

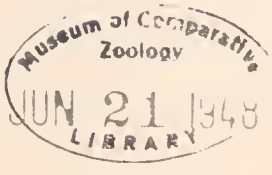
These publications are issued in numbers at irregular intervals. Each number of the Bulletin and of the Memoirs is sold separately. A price list of the publications of the Museum will be sent upon application to the Director of the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE
VOL. 101, No. 1

THE BIRDS OF KOREA

BY OLIVER L. AUSTIN, JR.

(PLATE)



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To American Military Government, in which I have been privileged to play a small part, and which has shown itself not unmindful of the needs of the natural sciences, as well as of the humanities and politics during and following the recent war, this work, accomplished with its help, is dedicated.

Oliver L. Austin, Jr.

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CONTENTS

	Page
Plan of the Work	3
Historical Sketch	6
Systematic List of Species	28
Family Gaviidae	28
Colymbidae	29
Diomedeidae	31
Procellariidae	32
Hydrobatidae	33
Pelecanidae	34
Phalacrocoracidae	34
Ardeidae	36
Ciconiidae	44
Threskiornithidae	47
Anatidae	49
Accipitridae	72
Pandionidae	87
Falconidae	88
Tetraonidae	92
Phasianidae	93
Turnicidae	96
Gruidae	97
Rallidae	102
Otidae	106
Rostratulidae	107
Haematopodidae	107
Charadriidae	108
Scolopacidae	114
Recurvirostridae	130
Phalaropodidae	130
Glareolidae	131
Laridae	131
Alcidae	136
Pteroclididae	139
Columbidae	139
Cuculidae	142
Strigidae	145
Caprimulgidae	151
Apodidae	152
Alcedinidae	154
Coraciidae	157
Upupidae	157
Picidae	158

Pittidae 169
Alaudidae 170
Hirundinidae 174
Campephagidae 177
Oriolidae 178
Corvidae 179
Paradoxornithidae 187
Paridae 189
Sittidae 196
Certhiidae 198
Timaliidae 198
Brachypodidae 199
Cinclidae 200
Troglodytidae 200
Turdidae 202
Muscicapidae 225
Prunellidae 231
Motacillidae 232
Bombycillidae 241
Laniidae 242
Sturnidae 246
Zosteropidae 248
Ploceidae 249
Fringillidae 250
Bibliography 273

Museum of Comparative Zoology
JUN 21 1946
LIBRARY

No. 1.—*The Birds of Korea*[1]

By Oliver L. Austin, Jr.

PLAN OF THE WORK[2]

This report on the birds of Korea is based on my own collecting and field experiences there between November, 1945 and May, 1946, on a review of all the literature available, and on specimens and other data, much of it unpublished, in museums and private collections in Korea, Japan, and the United States.

The geographical boundaries of the area are roughly those of the Korean peninsula and its contiguous minor islands southward from the Manchurian border. Though Quelpart and Dagelet Islands belong to Korea politically, I have eliminated them from consideration here, partly because I have no new material from either, but mainly because they are, with Tsushima (politically Japanese) distinct and individual zoogeographical entities, which should be considered separately rather than as a part of any other land unit.

Standardization of Korean place names and the adoption of a uniform Romanized spelling for them has not, until recently, been attempted. At least two, and sometimes three or more names are currently in use for the country itself and for each geographical entity within it. Since the liberation, the trend in most instances has been to recognize the Korean pronunciations instead of the sometimes better known Japanese, Chinese, or other variants. As my guide here I have followed the names and spellings adopted by the U. S. Army Map Service in its 1945 maps and terrain handbooks.

I have numbered only forms of specific rank. Where more than one subspecies of a single species occur within the territory, they are considered together conspecifically instead of being numbered separately. Only those species are numbered for which specimens have been recorded from the area by competent authority; records of species not based on specimens collected are considered hypothetical and are

[1] Published with the aid of a special gift from Mr. George R. Agassiz.

[2] With the author's absence in Japan, the editor gratefully acknowledges invaluble assistance from J. L. Peters, Curator of Birds. L.G.

enclosed in square brackets. There are a number of species for which Korean specimens no longer exist. Some were destroyed by the Tokyo earthquake in 1921, and others by the ravages of the recent war. But wherever specimens have been referred to in ornithological literature by reliable authors, the records are deemed valid, whether or not the specimens are now in existence.

Complete references are given to the original descriptions of all species and subspecies occurring in Korea. While no attempt has been made to give a complete synonymy, I have tried to include all synonyms originally described from the area.

For each species all the known specimen records are given, unless there are so many it would be pointless so to do, as in the cases of the Pheasant, the Magpie and the House Sparrow. Dates are given when known, and listed by provinces rather than by more exact collecting localities, which are frequently impossible to locate. The following abbreviations are used to denote the sources of the records, or the locations of the specimens if hitherto unrecorded:

AMNH — American Museum of Natural History, New York; contains the Andrews collection as well as a few items from Korean collectors obtained by exchange. The birds in the Rothschild collection, also housed here, are referred to separately.

Camp — Campbell, as recorded in his 1892 report. His specimens went originally to the British Museum, where they doubtless still are.

G&S — Giglioli and Salvadori's few records; specimens were deposited in the Florence Museum, Italy.

Kur — Kuroda (Nagamichi) collection, Tokyo, as recorded in his own writings and in Yamashina's holograph list. Destroyed in 1945.

LiWM — LiWong Museum at LiWong Palace Gardens, Seoul, Korea; data taken from Shimokoriyama's 1917 catalogue.

MCZ — Museum of Comparative Zoölogy, Cambridge, Mass.; contains my own specimens, plus a considerable number obtained by purchase from Korean collectors and by exchange with the Japanese; also one of the finest Chinese collections extant.

Mom — Momiyama collection, Tokyo, as gleaned from literature. This collection is still intaet, but in bad condition, poorly stored, uncatalogued and largely inaccessible. Its early specimens were destroyed by the 1923 earthquake.

Roth — Rothschild collection, now in the American Museum of Natural History, New York. Contains Hall's birds, a few Korean items received from Owston, and perhaps a surprising number of other odds and ends which may some day come to light. Rich in comparative material from Ussuria, Amuria and northeastern Siberia.

SoM — Songdo Museum, Songdo, Kyonggi Do, Korea; data from Snyder's 1937 catalogue; present status of specimens unknown.

SSC — Collections of the Seoul First Higher Common School and the Seoul Scientific Society, Seoul, Korea; taken from Yamashina's holograph list, which supplies data missing from Mori's 1923 catalogue. A few of these specimens are still available in the Seoul Natural History Museum, but most of them were scattered beyond salvage from their school repositories by the American occupation troops in 1945.

Tacz — Taczanowski's specimens, as recorded in his 1888 and 1889 papers. A few of these birds are now in the Rothschild collection.

Taka — Collection of Prince Taka-Tsukasa, Tokyo; from Yamashina's holograph notes. It contained most of the Korean material from the old Matsudaira collection, as well as Taka-Tsukasa's own Korean birds. It was destroyed in 1945.

Uch — Uchida collection, in the Bird and Mammal Laboratories, Ministry of Agriculture and Forestry, Tokyo; data taken from the specimen labels and the card file in the laboratories.

USNM — United States National Museum, Washington, D.C. Contains the Jouy collection, and a few more specimens obtained later from Korean collectors.

Won — Hong Koo Won collection, formerly at Anju, Pyongan Namdo, Korea, present status unknown; data from Yamashina's unique copy of Won's 1934 Check-List, in which Won has inserted all the missing dates for his own specimens.

Yam — Yamashina collection, Tokyo; data culled from his various writings and checked against his museum catalogue, which contains a number of unpublished records.

I have estimated the local status of each species from the available evidence. If a bird is not of regular occurrence, and hence not an integral part of the Korean avifauna, it is called a straggler. All others are grouped in the usual categories of summer resident, winter visitor, spring and/or autumn transient. Relative abundance is always difficult to judge, and, being largely a matter of individual opinion, is always open to criticism and correction. I have used loosely the terms abundant, common, not uncommon, uncommon, and rare, in the hope of achieving as fair and impartial an estimate as possible.

I have considered as summer residents those species which occur regularly in the territory in June, July and August, whether or not there is evidence of nesting. In most cases the summer resident doubtless breeds in the area, but mere presence during the nesting season is not proof of breeding, and many forms have been assumed so to do by previous authors which future investigation may prove do not.

Hence, while the use of this category implies that a bird breeds in Korea, I have tried in each such case to indicate what, if any, nesting proof is available. In many instances it is appallingly meagre.

The literature is written in seven languages, Japanese, English, French, German, Italian, Swedish and Dutch, by far the greatest part of it in Japanese. I have given all quotations from tongues other than English in translation instead of the original, for obvious reasons. At times an exact rendition into English of the foreign idiom, particularly the Japanese, is impossible. In most cases a free translation is employed to give as nearly as possible the meaning rather than the exact wording of the original. Quotations in the text are referred to the bibliography by year and page of the author. There are a few instances where individuals have published more than one paper in a given year. Lack of unit references in such cases should not engender much difficulty for those who wish to consult the original sources.

HISTORICAL SKETCH

Korea, even more than Japan, was *terra incognita* to occidental naturalists until Perry opened up the Orient by his visit to Yokohama in 1853. The first mention of Korea in ornithological literature dates back to the only bird collection to come out of Japan in the first half of the nineteenth century. Dr. Philipp F. von Siebold, a physician in the employ of the Dutch East India Company, lived at Nagasaki from 1823 to 1830, and sent home from there to the Leyden Museum in Holland, zoological material which later became the basis of his famous "Fauna Japonica." Siebold's Japanese birds were studied by Dr. C. J. Temminck, who in 1835 included a number of them in his elephantine "Nouveau Recueil de Planches Coloriées d'Oiseaux." In it he gave Korea as the type locality for three new species, the Slender-billed Shearwater and the Japanese Murrelet, "sur les côtes de la Corée et au Japon," and the Temminck's Robin, "sur les côtes de la presqu'île de Corée (Korai)." Later, in 1850, in the Aves volume of Siebold's "Fauna Japonica," which he wrote with Dr. Schlegel, Temminck added a fourth new species, the Pitta, which "avait été apporté vivant de la Corée au Japon."

It is likely that the material from which these four species were described came either from the northern Ryukyus, or from Quelpart or Tsushima Islands. None of them has proved subsequently to be of regular occurrence in Korea, which in Siebold's time was a name loosely applied to vague lands somewhere beyond Kyushu. Tem-

minck's Robin and the Slender-billed Shearwater have never been found on or near the Korean peninsula since then, the Japanese Murrelet is a straggler collected but once on the southern coast, and the Pitta is a vagrant taken three times on islands off the west coast.

It was not until several decades after Perry's visit to Japan that the Korean peninsula became better known to the western world. The Christian church seems to have made the first indelible occidental mark there, but business and science, both trailing closely on the heels of the first hardy missionaries, made much progress before the Japanese took the area over in the early course of their "Greater East Asia" program, and again shut out the rest of the world. The work on natural history during this period, roughly from 1870 to 1905, was done entirely by "foreigners," that is, occidentals, many of whom were in Korea for other purposes, and collected zoological specimens as an avocation. Nevertheless, they laid the foundation, and a good one, for future work.

The first authentic reference to Korea in ornithological literature was made in 1870, when the veteran English ornithologist, Robert Swinhoe, published in the Ibis his "List of Birds Collected by Mr. Cuthbert Collingwood during a Cruise in the China and Japan Seas, with notes." Despite its imposing title, the paper is only four pages long, and its sole references to Korea are the statements that three common birds, the Redstart, Kinglet and Brambling, were collected on islands off the coast.

Two years later, in 1872, Herr Otto Finsch printed in Vienna a longer paper under the similar title "Ueber eine Vogelsammlung aus den Kusternlandern der chinesisch-japanischen Meere." However, the expedition touched Korea only momentarily on one of the offshore islands, and but three birds were added to the list, the Scops Owl, Meadow Pipit, and Northern Phalarope.

Canon H. B. Tristram, who worked so extensively on oriental avifaunas, wrote the first paper dealing solely with the birds of Korea, a short note in the 1885 Ibis entitled "On a Small Collection of Birds from Korea," which mentions just eight species, taken along the coast by the personnel of the British survey ship "Flying Fish."

In 1887 appeared Giglioli and Salvadori's "Brief Notes on the Fauna of Corea and the Adjoining Coasts of Manchuria," describing the material in the Royal Zoological Museum of Florence brought back by the Italian round-the-world expedition in the "Vettor Pisani." The expedition spent the first week of August, 1880, at Fusan, then sailed northward along the east coast, stopping for three days each

at Broughton Bay and Wonsan, wintered north of the Korean boundary in southern Ussuriland, and then stopped again at Fusan on its return in February 1881. In Korea proper only fifteen species of birds were collected, none of them of particular interest or value.

The first major collection of Korean birds was made by the first American ornithologist to work there, Pierre Louis Jouy, who arrived at Seoul in May, 1883, after two years of collecting in Japan for the U. S. National Museum. The Museum evidently did not have funds to finance Jouy's Korean trip. To make it possible, he managed to attach himself temporarily to the U. S. Legation in some vague and obscure capacity, and he was able to collect in the neighborhood of Seoul all that summer. By autumn he had procured a position with the Chinese Customs Service of Korea, and journeyed overland to Fusan in November to take over his new duties. He stayed there nearly three years, collecting whenever he had the opportunity. He left the country in July, 1886, stopping for a few days at Wonsan, where he added a few more items to his collection.

Jouy's collection of over five hundred specimens went to the U. S. National Museum, where it lay unstudied for over two decades, while other men described from specimens collected later, a number of the new forms it contained. For Jouy had come home not only out of funds, but physically incapacitated. Financial troubles forced him to leave his priceless new Korean material to be attended to later, while he made a paid collecting trip to México. Under such stress his health failed rapidly, and he died of tuberculosis in 1894, fighting a lingering illness which incapacitated him entirely during his last few years. That he was never able to work up his own material, and to put on paper for posterity an account of his Korean experiences and his personal observations of the country and its birds was tragedy not only for Jouy himself, but for the ornithological world as well.

His collection was studied eventually by his friend A. H. Clark, who in 1907 described its nine still unrecognized new forms. Clark was able, most fittingly, to perpetuate Jouy's name by giving it to one of the most abundant and characteristic of the Korean birds, the eastern race of the Grey Heron. In 1910 Clark finally published a complete report on the 554 specimens in the collection, but, as Jouy had apparently kept his field notes in his head, there was nothing to write of them save what the mute skins themselves could tell. Clark did find one short completed manuscript of Jouy's, a revision of the Paradise Flycatchers, which he published for him posthumously in 1910. It contains the only first hand account of Korean birds in Jouy's own

words extant, a tantalizing fragment of the wealth of material that was lost forever when he died.

As Jouy was leaving Korea in 1886, a famous Polish field ornithologist was entering it via Vladivostok. He came overland to Wonsan on the east coast in the spring of 1886, and then went on to Seoul, where he stayed until he retraced his steps in 1888. His first shipment of birdskins reached Europe in 1887, where his patron, M. L. Taczanowski, worked them up and published immediately. He catalogued 107 species in his "Liste des Oiseaux recuellis en Corée par M. Jean Kalinowski," and the first of Jouy's previously collected types was lost to America by Taczanowski's description of the Korean Crested Lark. Another important contribution in this paper was the discovery in Korea of Tristram's Woodpecker, previously described from Tsushima, but which Taczanowski, thinking it new, named *kalinowskii* in honor of its collector.

Kalinowski did not find ornithological work in Korea easy. Taczanowski tells of his difficulties in finding good collecting grounds, his tribulations from the lack of transportation facilities, and his troubles with the "brutal, inhospitable" people. He went through a terrific cholera epidemic in Seoul, during which the people died daily "by the hundreds." Conditions were so extreme that the cadavers could not be buried, but were carted out of the city and dumped in the surrounding fields, "which made all the environs so horribly stinking it was impossible to venture out." But he managed to continue his work nevertheless, and when he left the country in 1888 he had not only added 72 species to the previous list, but had provided field notes and other valuable observations on these and other species, which Taczanowski incorporated in the supplemental paper in 1888. I cannot read these without regretting the lost details of Jouy's experiences.

Korea received continual ornithological attention through the "mauve decade" of the 'eighties. As Kalinowski was leaving, an Englishman, C. W. Campbell of Her Britannic Majesty's Consular Service arrived to carry on his official duties at Seoul and Inchon (Chemulpo in those days) throughout 1888 and 1889. As with so many colonial Englishmen, birds were his hobby and avocation, and he spent all his spare time afield. He collected specimens of 112 species, 17 of them new to the Korean list, which he published, together with his field notes, in 1892. And the types of two more common Korean birds, the Korean Crow-tit and the Manchurian Bushwarbler went to the British Museum while Jouy's identical material collected almost ten years earlier still lay unattended in Washington.

With Campbell's departure there began a void in Korean ornithology that was to last over twenty years. Science and art alike suffer during periods of political unrest, and thrive best only under stable economic conditions. The subsurface rumblings of internal strife were already being heard, and shortly after the turn of the century all serious work in natural history was halted while the Japanese took the country over, cutting off the peninsula again from the western world, culturally, physically and economically.

Alan Owston was active in Yokohama from 1890 until his death in 1915, sending out Japanese collectors to gather specimens in Japan and eastern Asia, most of which went to European museums. Some of these collectors passed through Korea and picked up a few odds and ends, which are now scattered throughout the world, though most of them are in the Rothschild collection. But it was not until after Owston's death that they spent any appreciable time there, and his own Korean material was only fragmentary.

During the score of years between 1890 and 1910 there was a little desultory collecting done by a few hardy and venturesome occidentals. In the winter of 1902–1903 Dr. William Lord Smith of Boston made a trip along the southwest coast, from Moppo southward, partly by junk and partly afoot, during which he collected a few birds. These eventually reached the National Museum and were incorporated in Clark's 1910 report on the Jouy collection. As the doctor's contribution consisted of twelve skins without data, eight Pheasants, a Swan, a Goose, a Ruddy Sheldrake and a Spot-billed Duck, it is evident that his collecting was governed by gastronomic and sporting impulses rather than scientific.

A short note in the 1904 Ibis announces that Robert Hall, the Australian ornithologist reached London safely with 401 birdskins collected in eastern Siberia in the Lena River area between June and August 1903. But nowhere in literature can I find any mention of the fact that Hall stopped off for two weeks at Wonsan en route from Melbourne to Vladivostok, and collected over two hundred birds there! In Lord Rothschild's private accession book, which contains the only original cataloguing ever given his mammoth collection, is the notation, under date of 22 August 1903, "received 212 skins, Robert Hall Corean birds." While these are doubtless in New York, to find them all would require an exhaustive search through the entire collection, which unfortunately I did not have time to do. But I did find some fifty of them, of twelve species, all fairly common land birds. All are labelled "Wonsan," and their inclusive dates are from 27 April to

11 May 1903. Hence we may deduce that Hall probably had to await connections at Wonsan for transportation to Vladivostok, and killed time meanwhile by collecting in the vicinity. From Rothschild's accession date, Hall evidently forwarded his Korean birds to Tring before going into Siberia. He reached Irkutsk 4 June 1903, and collected in Siberia until late August. He reported on his Siberian birds in the 1904 Ibis, and Hartert notes (*idem*) in introductory remarks that the birds are all "in worn plumage and badly prepared," which is equally true of his Korean specimens that I have seen. But no mention of any sort was made of his collecting in Korea, or of the Wonsan birds themselves, which by then were presumably scattered throughout the Rothschild collection. It is unfortunate the collection was never catalogued as received, for there may be some additions to the Korean list in it, and certainly some valuable dates among the specimens I was unable to locate in the short time at my disposal.

Malcolm Playfair Anderson, a globe-trotting American collector in the employ of the Duke of Bedford, first arrived in Korea in 1905 to gather zoological material for the British Museum. Information about him, and particularly about his two visits to Korea, is disappointingly scarce. One of the most complete accounts is an article in Japanese entitled "The Zoological Expeditions of the Duke of Bedford" by Professor Teizo Esaki, head of the Entomological Laboratory of Kyushu Imperial University. It lists (1936, 1508) Anderson's itinerary in southern Korea in 1905, which Esaki pieced together from Anderson's insect data, and from information furnished him by Anderson's old Korean interpreter, Kim, but makes no mention of the second trip made in the autumn of 1906 to "a region sixty or seventy miles northeast of Seoul." Anderson himself wrote (1907, 146–147) the only published record of this trip, a brief, popular account which gives no essential details, and mentions by their generic names only a few of the species seen and collected.

Anderson landed at Moppo in late September 1905, after several months of collecting on Quelpart Island. He worked through the autumn and early winter in almost all the southern provinces, going north only as far as Chungchong Pukto and Kyongsang Pukto. He left Fusan on 7 January 1906 for Manila, Philippine Islands, but shortly came north again later that spring to spend the summer working in Sakhalin and the Kurils. On his way south at the end of the summer he engaged as an assistant a young Japanese collector named Hyojiro Orii, whom Alan Owston recommended to him. Orii tells me he and Anderson landed at Fusan together in September, 1906,

and went directly to Seoul for their necessary collecting permits. From there they went to the Diamond Mountains in Kangwon Do, where they collected for several months, mostly in the vicinity of Kinka. They returned via Seoul to Fusan in December, collected on Tsushima Island for a month, and finally reached Nagasaki in March, where they packed and shipped their specimens to the British Museum before leaving for China. As Orii remembers it, they collected in Korea on this trip about 1400 specimens of birds and mammals, roughly half of each, the birds in series of five of each species, the small mammals in tens.

Hence there are probably about a thousand Korean birds in the British Museum collected by Anderson on his two trips there. But while the mammals and insects he collected at the same time have been reported on in detail, the birds have not. They were evidently examined for possible new forms shortly after they arrived in England, as Ogilvie-Grant's immediate description of *Sitta corea* in 1906 attests, but apparently nothing else has been done with them since. The only other reference in literature to this wealth of material is the incidental listing of its series of seven Korean blue magpies in Hartert's 1917 description of *Cyanopica cyanus interposita*. Anderson's father published an obituary of his son in the Condor (**21**, 1919, pp. 115–119), but there is no other mention of him or of his extensive collecting in contemporary literature.

In 1912 Roy Chapman Andrews went to Korea for the American Museum of Natural History, to make a traverse of the northern border country, and particularly to visit Paekto San ("White-headed Mountain," the famous peak in Hamgyong Pukto). Though he concentrated his collecting primarily on mammals and big game, he brought back 191 birdskins. A few of these, mainly waterfowl, were taken at Ulsan, Kyongsang Namdo, where he made his final preparations for the expedition, but the greater part of them are from the north. Reaching Hamgyong Pukto in early April, he went right through the high country, emerging in Pyongan Pukto in late June. His specimens are dated from 14 April in Hamgyong Pukto to 15 June on the Yalu River in Pyongan Pukto. They were identified, accessioned and catalogued immediately after they reached the museum, but they were never studied in detail, and no report on them has ever been made until now. In those days the American Museum of Natural History did not have sufficient Asiatic material to allow for adequate comparison, so Andrew's birds suffered the same fate as the Jouy collection twenty-five years earlier at the National Museum. Andrews'

was the first collection to be made in northern Korea, and it contains adequate material of half a dozen or more valid subspecies which were described subsequently either by Europeans from material taken later in nearby Ussuria, or by the Japanese from the birds Orii collected in Hamgyong Pukto almost twenty years later! As well as affording the only comparative material available to western scientists to judge the validity of forms described by the Japanese from that area, the collection also provides the only early spring dates for Hamgyong Pukto, for later collectors did not reach there until July. Probably the most interesting birds in the collection are two immature male Chinese Mergansers, of which less than thirty specimens are known.

From 1906 to 1945 the Japanese ran Korea much their own way, ornithologically as well as politically and economically. The first decade was spent in "Japanizing" the country, and it was not until 1909 that conditions became settled and quiet enough so that time and effort could be spent on such non-essentials as the study of natural history. In that year a few birds were collected as the nucleus of the LiWong Museum skin collection, which remains to this day still the best single collection of Korean birds. Various Japanese added to it during the next five years, but the major portion was gathered by Seichi Shimokoriyama between 1914 and 1917.

The first Japanese to publish on Korean birds was the late Dr. Akira Iizuka. After graduating from Tokyo University in 1897 at the age of 29, Iizuka joined its faculty in the zoology department, where he gave their first groundwork in biology to the present generation of leading Japanese ornithologists. He is remembered fondly today by Taka-Tsukasa, Kuroda, Yamashina and Uchida, all of whom were once his students. He spent several summer vacations in Korea, and wrote three minor papers on its birds, the first in 1912, the others in 1914. He later became a distinguished zoologist, head of the Zoological Department of the Tokyo Scientific Museum, and the author of several textbooks on embryology and marine biology. His name heads the list of authors of the 1914 "Hand-List of the Birds of Korea," but it was an honorary authorship, meant to lend weight and authority, for the paper was almost entirely the work of Seichi Shimokoriyama, the junior author, who was one of his students.

Shimokoriyama was born in 1883, and graduated from the Special Teacher's Training School attached to Tokyo University in 1904. He came to Korea in 1911, and in 1914 was an assistant technician working in the LiWong Museum. His 1914 "Hand-List" was an unfortunate beginning. While its authors are Dr. Iizuka, Prince Taka-

Tsukasa, Marquis Kuroda and Seichi Shimokoriyama, we are assured by Won (1934) that it was the work of the latter, "assisted" by the other three. How much of it Iizuka did is questionable, and Taka-Tsukasa and Kuroda probably contributed no more than the names of a few specimens sent them for identification. Certain it is that neither of them saw a proof of the paper before its publication, for immediately after it appeared both these reputable ornithologists published apologies and corrected some of its more glaring errors. It is indeed a careless paper, merely an unannotated list, giving neither dates, localities nor authorities for the 309 species listed, which were reduced by the corrections to 295.

Shimokoriyama was not discouraged by this reception of his paper. He collected industriously in 1915, 1916 and 1917, building up the LiWong Museum's skin collection. With the museum's preparateur, Naotaro Toda, he made trips to the northern and eastern provinces, and continued collecting in neighboring Kyonggi Do as well. In October, 1917, he published "A List of the Birds in the Seoul Museum," an accurate catalogue of the 1900 specimens of 318 species and subspecies in the collection, with collecting data, plus a list of the 37 species reported from Korea by others but missing from the Museum. He made a few minor errors, quite understandable under the circumstances, for he had no comparative material, almost no reference books, and received but little assistance from the authorities in Japan to whom he had evidently sent some of his more puzzling specimens for identification.

It is one of my chief regrets that I was unable to spend more time with this collection. The few short hours I was able to give to it (with my interpreter to help me read the labels) were in considerable discomfort, in the numbing, penetrating cold of the dark, gloomy, long-closed stone building in February. The building had to be opened especially for me, which took hours of palavering, searching for the keys, and fumbling with rusted locks that perversely refused to work. There was neither light to see by nor room to work, and I went through the drawers bundled in my heaviest parka, wearing wool gloves and fur ear-muffs, and I promised myself I'd come back to study it thoroughly when the weather was warmer, which I was never able to do. But I did check many of the doubtful entries in Shimokoriyama's list, and in almost every case I found the authenticating material there, good, well-made skins, by the way, well preserved and correctly identified and labelled. I also found three drawers full of nests and eggs which have never been reported, and made an inventory of

them. Most of them were collected in 1910, and though some of the labelled identifications are questionable, not a few of the others comprise for their species the only valid Korean breeding records.

Shimokoriyama never received encouragement nor recognition of his ornithological work and ability. Though his paper is listed in later bibliographies, about the only Japanese acknowledgment of it is in Kuroda's 1918 paper, in which he brings his own 1917 list up to date by adding the seventeen LiWong species that he missed. The 1942 Hand-List omits mention of many specimens it records from Korea. After 1917 Shimokoriyama did no more collecting and no more bird work himself, though he did encourage others. He gave himself over to other duties at the LiWong Palace Gardens, which contain a public park, a zoo, a horticultural section, and many historical and art exhibits. In 1928 he became a full technician (a position comparable to a full professorship in America) and head of the Gardens.

The first Japanese of top-rank ornithological reputation and ability to work on Korean birds was Marquis Nagamichi Kuroda, ScD., Member of the House of Peers, Member of the Imperial Household, Honorary Fellow of the A.O.U., etc. Born in 1889, the son of a wealthy and ancient noble family, he graduated from Tokyo Imperial University in 1915. Two years later he made a collecting trip to Korea and Manchuria. Landing at Fusan early in April, he worked rapidly up the west coast through Cholla and Chungchong provinces to Seoul, then went through the Pyongan provinces and on into Manchuria. He left Korea the 4th of May, having spent just one month there. However, he collected intensively, bought specimens wherever he could, and had still others given to him by such men as Professor Mori and Yasukichi Kuroda. It was as one of these gifts that he procured the type specimen of his most famous discovery, Kuroda's Sheldrake, one of the great ornithological rarities. He published the results of his trip in December 1917, shortly after his return, in Japanese, and the Korean section of his "Birds of Korea and Manchuria" remains the only complete and thorough compilation of the contemporary ornithological knowledge of the area ever done. It is interesting to note in retrospect that, while he had previously examined specimens from the LiWong collection, he evidently did not visit the Palace Gardens on this trip, for his book makes no mention of the 1915, 1916, and 1917 additions to it. He and Shimokoriyama must have been close together going up the west coast that spring, judging from the dates of their specimens, yet while Shimokoriyama in his introduction gives credit and thanks to Kuroda for previous assistance, Kuroda never mentions

Shimokoriyama. Kuroda never returned to collect in Korea, but he kept up his contacts and his interest in the area, as frequent papers as late as 1940 attest. He continued to add Korean specimens to his collection, by purchase from Takahashi and others, until the war. All his possessions, except the two specimens of *Pseudotadorna* and a few other types, were burned in May 1945.

The "Grand Old Man" of Korean natural history, and widely accredited as being the foremost local authority on all Korean fauna is Professor Tamezo Mori, who lived in Seoul from 1909 until the American forces packed him back to Japan early in the autumn of 1945. Born in 1884, and a graduate of the Department of Science of Tokyo Imperial University in 1904, he was for many years science professor at the "Preparatory School," officially the "Keijo First Higher Common School," a sort of "prep school" for Keijo (Seoul) University. His main interest was ichthyology, but he dabbled in all the fields of vertebrate and invertebrate zoology, and his complete bibliography covers a wide range of topics. His first paper, in 1916, a "List of Vertebrate Animals of Korea" contains a purely nominal catalogue of the 306 species of birds previously recorded from the area. While he collected a few birds himself, most of his field work was done with fish and mammals. He supervised the gathering of the exhibition collection formerly at the First Higher Common School, and, with some help from Kuroda, identified most of the specimens in this and the Natural History, or Seoul Scientific Society collection. He had as an assistant a Japanese collector, Eizo Takahashi, who collected widely all over Korea for a period of ten years or more, visiting Quelpart and Dagelet Islands, Pyongan Pukto, Hamgyong Pukto and Kangwon Do, building up a representative collection for the School and the Society, and selling his duplicates to Taka-Tsukasa, Kuroda, Momiyama and others in Japan. In 1923 Mori contributed the vertebrate section to "The Catalogue of Specimens at the Exhibition of Specimens of the Natural History of Korea," published by the Natural History Society, and listing 371 species of birds, with no data other than a single collecting locality for each species. Part of this material is still intact, an exhibition collection of poorly mounted, faded and bedraggled specimens on display at the Society Museum. But the greater part of it, which was at the First Higher Common and at other schools in Seoul, has been scattered and lost. The American forces took over most of the schools to use as barracks, and specimens and books and laboratory equipment were ruthlessly jammed into jumbled storage in cellars and bomb shelters to make room for cots and the army's im-

pedimenta. I found remnants of what must have been this collection in odd caches all over the city, all of it in hopeless condition, without data or clue of ownership, deteriorating rapidly.

Mori's sixteen other bird papers are mostly of a minor nature, short notes on field trips, or adding rare stragglers to the Korean list. He described the Korean Black-game as a fancied new race, since disallowed, and collaborated with Nagamichi Kuroda on three papers describing new Korean subspecies of a grouse, a nuthatch and two woodpeckers, in which his contribution seems to have been the material, and Kuroda's the description. His final paper, however, in 1939 on the need for conservation of birds in Korea, shows his appreciation of the situation, and his knowledge of the local fauna. If, in the decades to come, any Koreans make worth-while contributions in the field of natural history, it will most likely be one or more of his erstwhile students, in whom he kindled the latent spark.

Marquis Yoshimaro Yamashina, Sc.D., Member of the House of Peers, MBOU, MBOC, Life Associate of the A.O.U., etc., is the foremost Japanese authority on the systematics of Korean birds. He sent his collector, Hyojiro Orii to Korea in 1929, and received from him a veritable stream of specimens. Orii collected through the northern provinces from April to November 1929, and in Cholla Namdo and on Quelpart Island from December to the following February. In that time he sent his patron 1940 specimens of 279 forms. Yamashina published Japanese descriptions of the half dozen new subspecies among them in short papers during the next two years, and in 1932 wrote in English a complete report on Orii's collecting. Meanwhile he was working on his "Natural History of the Japanese Birds," a major work which compares well with modern American and English treatises of a similar nature, and in which appear various odds and ends of previously unpublished Korean material. Later Orii collected extensively in Manchuria, and Yamashina was able, in the light of this new material, to revise many of his original conclusions on the racial affinities of the Korean birds. Yamashina himself made but one short trip to Korea, for one month in the summer of 1936. He tells me he went to observe rather than to collect, and visited Seoul, Wonsan, and the Diamond Mountains. Nevertheless, he brought back some 200 birdskins, and a number of nests and eggs which have not, until now, been reported in literature.

Yamashina's collector, Hyojiro Orii, who has doubtless collected more Korean birds than any other single person, has had an interesting career. He learned his trade under the tutelage of Alan Owston's

taxidermists in Yokohama in 1904, while still in his teens. He first visited Korea, it will be remembered, in 1906 as assistant to Malcolm Anderson, who improved his technique considerably. After leaving Anderson's employ in 1907, he collected for Owston for several years, mostly in China, until Owston failed in business and left him stranded in Yunnan, an uncomfortable experience which caused him to forsake collecting indefinitely, for the less hazardous pursuit of farming in Hokkaido. Marquis Kuroda finally prevailed on him to go back into the field, and in 1921 and 1922 he made the collections on which Kuroda based his "Birds of the Ryukyus." From 1923 until the start of the war he collected solely for Marquis Yamashina, and during that time covered most of the (then) extensive Japanese Empire, collecting in Formosa, Manchuria, Sakhalin, the Kurils, Micronesia and all the lesser Japanese Islands as well as in Korea. With the advent of the war he retired to his small farm in Hokkaido, where he is still living, tilling his ground and carving pipes in his leisure time, remarkably sturdy and hearty for his sixty-odd years.

Viscount Matsudaira bought many Korean specimens for his private collection between 1915 and 1920. Most of them came from the specimen-dealer's shop in Yokohama established by one of Alan Owston's Japanese assistants after Owston's death. They were evidently collected by Owston-trained bird-skinners, mostly from 1915 to 1918, and, while good skins, they were carelessly labelled. When Matsudaira suffered financial reverses in 1925, and was forced to dispose of his collections, Prince Taka-Tsukasa bought most of his bird skins, and they are listed here as part of the Taka-Tsukasa collection. A few of the old Matsudaira skins are still to be found in other places. There are some in the Yamashina and Uchida collections, and I have even encountered a few in New York and Cambridge.

Prince Taka-Tsukasa, after acquiring the Matsudaira collection, bought more Korean material, principally from Eizo Takahashi, who collected for him (as well as for Mori, Kuroda and Momiyama) in central Korea from 1924 to 1928. He also purchased skins from Hong Koo Won and a few others. All Taka-Tsukasa's collections were destroyed, together with his museum, his home, his library and his aviaries, by the fire-raids in the spring of 1945.

Tokutaro Momiyama also obtained a little Korean material, which is extant, though badly stored and in poor condition. His original collection, which contained only a few Korean birds, was destroyed by the Tokyo earthquake. After 1923 he built it up again, buying mostly from Takahashi, and a few specimens from Won and others as

well. He never visited Korea himself, but he deals with Korean birds summarily in thirteen of his papers. He described fourteen fancied new forms from Korea alone, none of which is recognizable, and most of which, to their credit be it said, were invalidated by other Japanese. As N. Kuroda (1932, 384) wrote, "All Japanese ornithologists regret very much that the forms described as new by Mr. Momiyama, over 100, are mostly the result of much unwarranted splitting, the great majority of them not being recognizable as different, their names, with very few exceptions, therefore becoming synonyms."

The Bird and Mammal Laboratories of the Ministry of Agriculture and Forestry, under the directorship of Dr. Seinosuke Uchida, received over six hundred Korean birds in the flesh from Hideo Hashimoto, a Japanese light-house keeper, between 1924 and 1936. Three-quarters of these birds were received in too decomposed condition to preserve, but they were all identified by Dr. Uchida and catalogued. The remainder are still in the Uchida collection, where I have examined them. They are mostly casualties which struck a light-house in migration, and come from Shichihatsu and Také Islands near Moppo, and Hachibi Island near Inchon.

Only fragmentary reports have ever been published on the Korean material in the Matsudaira, Taka-Tsukasa and Uchida collections, though the specimens themselves have been the basis of many formerly doubtful status reports in the Hand-List of Japanese Birds.

This check-list, which has appeared at ten year intervals since 1922, catalogues the avifauna of all the possessions of the old Empire. The most authoritative compilation available, it all too frequently makes cryptic, dogmatic statements for which no substantiation can be found. It was the habit of the committee, when compiling a revision, to gather together in one of the Tokyo museums, and each to contribute casually to the new volume any new information he may have had in the way of records or specimens. No concerted effort was ever made to check the validity of old records, errors from some of which have been perpetuated since the first edition, and no references are given as to the sources of information. While, theoretically at least, such a Hand-List should be based on information already in literature, some of its substantiating material was never published, but rested in collections which have since been destroyed, and can never again be checked.

Lesser contributions to the knowledge of Korean birds have been made by several other Japanese, chief of whom was Yasukichi Kuroda, (no relative, but an acquaintance of Nagamichi's) who was at one time an assistant engineer in the Central Industrial Experiment Sta-

tion at Seoul. Fond of hunting, ornithology was his hobby and avocation, and he became a member of the Ornithological Society of Japan. His early papers leave much to be desired, those in 1918 and 1919 being marred by the use of loose and unidentifiable common names, and containing many sight records of questionable accuracy. His last two papers, however, one on quail and the other on cranes, are real additions to the knowledge of these species' habits in Korea.

Hideo Hashimoto, the light-keeper who sent so many light-house-killed birds to the Uchida collection in Tokyo, kept records of the birds he saw at his lonely island posts, and made observations on the local breeding species as well. Most of his nesting data were published for him by Ishizawa and Kobayashi, but the sight records he mailed to the Bird and Mammal Laboratories eventually appeared under his own name in the Ministry of Agriculture and Forestry's annual "Reports on Birds and Animals," an obscure publication where they have been largely overlooked. While some of his sight identifications of difficult species are doubtful and have to be disregarded, the lists still contain many dependable migration dates, and much other information of value.

Yujiro Yoshida, an assistant technician of the General Government in Seoul, is known best for his detailed and interesting paper, published in 1932, on falconry in Korea. This medieval sport of kings is still practiced in the northern and eastern mountain districts, where it has persisted, unchanged, since feudal times. Pheasants provide an abundant and fitting quarry, and rabbits and doves are also hunted in this manner. The Goshawk is the species most frequently trained, though the rarer Peregrine is preferred when obtainable.

One more interesting oriental personality has left his mark on Korean ornithology. Among the sixty million Koreans, only one of them has made any attempt to do serious bird work, to contribute to the knowledge of the avifauna of his country and to publish his findings. This is Hong Koo Won. (The Korean pronunciation of his name is Won, Hong Koo, which by the Japanese reading of the characters is Gen, Kohkiu. On his own specimen labels he writes it Konkyu Gen.) Won's work is very difficult to evaluate for, despite its obvious wealth of material, it is frequently maddening in its omissions, its ambiguity and its questionable veracity. But one must remember that Won was severely handicapped by the social system in which he lived, by the Japanese policy of keeping all Koreans in subordinate positions. When one considers the difficulties he overcame, the lack of instruction, assistance, encouragement and funds, one is forced to admire his ambi-

tion and perseverance and to acknowledge his accomplishments as outstanding among his people.

Won was born in 1888, graduated from the Suwon Agricultural and Forestry College in 1910, and became a teacher in the Korean schools. He started collecting birds in 1920 while teaching at the Songdo Higher Common School, to use as natural history lecture material. He was evidently encouraged and helped by Mr. L. H. Snyder, the American principal of the school, who later arranged for Won and other students to sell specimens to several American museums, notably the Museum of Comparative Zoölogy and the U. S. National Museum. He also received some assistance from Shimokoriyama and Mori, who loaned him books and allowed him to study the LiWong and Seoul School collections, rare privileges indeed to be accorded a Korean in those days.

At first Won collected in nearby Kyonggi Do, but as his interest grew, and he found he could help his finances by selling his duplicates to Tokyo collectors, he began to use his summer vacations for collecting trips farther afield. He went to the Diamond Mountains in Kangwon Do, and to Dagelet and Quelpart Islands, and spent a month in the summer of 1929 with Orii in the mountains of Hamgyong Pukto. About this time he transferred to the Anju Agricultural School in Pyongan Namdo, where he continued to collect assiduously, and from where in 1932 he published the first of his ten papers. He had picked up three stragglers new to Korea, the Swallow Plover, the Pitta and the Little Owl, each of which was reported in at least one paper, and sometimes in two or more. For the 25th anniversary celebration of his alma mater in that year he wrote his first "List of Korean Birds," a tabulation of the species and subspecies in his collection, without data other than locality.

The following year he was able to go to Japan to study at the Kagoshima Imperial College of Agriculture and Forestry. Before leaving there he revised and amended his previous list, and in 1934 published in the college bulletin the most recent "Hand-List of Korean Birds." This paper is more fully annotated, and brief notes are added on the status of each species, which unfortunately are not substantiated by any evidence, and in some cases are not at all trustworthy. Most annoying is his omission of the collecting dates, even of his own specimens, which would have been most useful.

Won seems to have been fired by a patriotic ambition (lamentably universal among enthusiasts of every nationality including the American) to compile as large a list of species and subspecies as possible,

without regard for any comprehension of the *modus operandi* or *raison d'etre* of its component parts. By this time his own collection had reached 258 species, and he lists for Korea, including Dagelet and Quelpart Islands, the staggering total of 416 species and subspecies. The number of forms he dogmatically states breed in Korea exceeds those that actually do, and as he makes other similar misstatements with no attempt at proof, it is difficult to know when to believe his more probable assumptions. The Japanese, though guilty to a lesser degree of the same negligence, solved the problem by not believing him at all, and by disregarding any of his records unless verified by Yamashina, Kuroda, Mori, or some other less impeachable authority. However, his writings contain a great deal of dependable and useful information, and I have tried to evaluate his data accordingly.

When he returned from Japan in the middle nineteen-thirties, Won went again to his old position at Anju. He published several short papers, including one on the "Urgent Need for Bird Protection in Korea" (1935) which pleads for the following reforms:

1. Revision of the hunting regulations to give protection to song and insectivorous species as well as game birds.
2. Regulation of commercial traffic in protected species.
3. Establishing a "Bird Investigation Institute" under direct control of the government, to study the food habits of all birds and animals.
4. Training the regular police to enforce the game laws.
5. Education of children in the schools to inculcate in them early in life a love and appreciation of birds.

With this last point in mind, he had previously attempted to establish a set of common Korean names for the birds, similar to the Japanese (which they in turn had copied from the American example). In his 1932 paper he gives for each species a Korean name written in the Korean phonetic alphabet. I have omitted them with much regret only because, on translation, I found them too clumsy and carelessly manufactured to be practical or usable. The Korean language contains native names for perhaps a score of common species, those distinctive birds that every peasant recognizes, such as the sparrow, the wren, the hawk, the duck and the crow. For those without such a name, Won supplied one by translating into Korean the available Japanese, and occasionally the scientific appellation, thus including the bad features of both.

I had hoped to meet Won and to see his collection, but during my stay in Korea both were at Anju which, being north of 38°, was in the Russian zone, and hence inaccessible to Americans. I met several of

his students, however, and for a time we had on our staff at Suwon an entomologist who knew him well and had even collected birds with him at Songdo. With one or two brilliant exceptions (such as Bok Sung Cho, present head of the Natural History Museum in Seoul, and Ho Jik Kim, director of the branch Agricultural Experiment Station at Sosa) I found the Korean scientists not only lacking in knowledge and ability, but regrettably ignorant of any conception of the meaning of truth. To the oriental mind truth is the convenient thing, the polite thing, the honorable thing, not the accurate fact, and the Korean carries this conception of it from his daily living into his scientific work. He tells you first what he believes it will do him the most good to tell you, and secondly what he thinks it will please you most to hear, regardless of the veracity or accuracy of his facts. And to me, that is the only explanation of the, shall we say inconsistencies, in Won's writings.

"Foreigners" were not entirely inactive during the Japanese regime. D. J. Cumming, a Canadian missionary, for many years head of the Chungil Mission High School in Kwangju, Cholla Namdo, was strictly an amateur ornithologist, and did no collecting, but he was interested enough in birds to make himself well acquainted with the more common species he observed about him. In 1931 he delivered in English to the Korean Branch of the Royal Asiatic Society in Seoul, a lecture on his bird observations, which was published in 1933, with additions, by the Society. His apologia in his introduction is interesting: "I know of at least three men in the country, one Korean and two Japanese, who are much better fitted both from position and experience to tell about the birds of the land. I refer to Mr. Wun [Won] of the natural history department of the Songdo Boys' School, Dr. Mori of the Keijo Imperial University, and Mr. Simogoriyama [Shimokoriyama], Director of the Prince Yi [Li Wong] Museum and Zoological Gardens. I wish to acknowledge to them a great debt for their interest and help in my studies and were it not for the barriers of language would insist that they be the ones asked for this paper." Despite its amateur nature, the book contains many new and original data. I have quoted from it freely.

Mr. L. H. Snyder, the American principal of the Songdo High School, who evidently did so much to help Won get his start, published a catalogue of the school collection in 1937. It is a rare little pamphlet, printed in Seoul and, as it was designed only for local use, given a very limited distribution. While its scientific names and dates are in English, the Japanese common names are in Kata-kana, and the localities

are given only by their Chinese characters. This collection was started by Won, and many of the data are duplicated in his prior lists, but other students and instructors contributed to it after Won's departure from Songdo. It contains no series, and very few duplicates, most of them having been sold in Japan and America to help finance the school's bird work.

Snyder and his students also collected some nests and eggs, of which no mention has ever been made. He sent some fine sets of raptor eggs, a number of which are the only Korean breeding records for their respective species, to Colonel L. R. Wolfe, USA, who has kindly furnished me a list of them and their data. He also shipped to Mr. Herbert Brandt of Cleveland an unknown quantity of avian material, of which I learned only recently, too late to investigate further for possible inclusion here.

During this period, from 1925 to 1940, a number of Korean birdskins reached American from other sources. There are a few birds in the Harvard collections furnished by the Chosen Christian College at Seoul. Kuroda, Yamashina, Momiyama and other Japanese exchanged some of their Korean material with American curators, and I was delighted to find scattered among the Museum of Comparative Zoölogy cases, more than a few skins bearing the names of Orii, Takahashi or Won on their labels, acquired in this manner.

The experienced Swedish collector and naturalist, Sten Bergman, visited northern Korea in 1935 and 1936, collecting mostly in Hamgyong Pukto. He published a popular account in English of his experiences, which contains a regrettably small percentage of the wealth of ornithological information he must have amassed, and two papers in Swedish that are not available to me. The specimens he collected are presumably in Sweden.

My own advent into the Korean scene was quite fortuitous, and the furthest thing from my mind until a week before I arrived there. After two years of service in the South Pacific, the U. S. Navy gave me a short course in Military Government, and then loaned me, with a number of other naval officers of varied talents, to the Army for the invasion and occupation of Japan. Under Army auspices we were given an intensive course in the Japanese language, culture, customs and geography, which we had barely completed when the Japanese capitulated and made invasion unnecessary. Late in October, 1945, I found myself in Tokyo, assigned to agriculture. But the particular draft of officers with which I arrived was suddenly reassigned and shipped off to Korea, where we were to learn about Koreans, and about Korean culture, customs and geography, "the hard way".

My duties in Korea were to assist in the rehabilitation of the Korean agricultural experiment stations, with headquarters at the Central Agricultural Experiment Station at Suwon, thirty miles south of Seoul, in the heart of the coastal rice-producing belt, in central Kyonggi Do. While this province, as the political, social, cultural and economic center of Korea, has received more attention ornithologically than all the other provinces combined, it is one of the poorest collecting grounds in Korea, miserably over-populated and with but scant cover. Nevertheless, it offers a wide range of varied terrain, from the coastal marshes and extensive cultivated paddies in the lowlands, to the occasional patches of woodland on the hillsides, and the barren rocky mountain tops. Suwon offered compensating advantages as a base of operations, such as better living conditions than the average in Korea, comparatively comfortable quarters, transportation facilities, and, best of all, one of the best scientific libraries in Korea.

I remained at Suwon, and, when not otherwise engaged, collected birds throughout the winter. There I shared quarters, "ten-in-one" rations, jeep, house-boy, and various assorted responsibilities and headaches with Major Victor I. Schember, AUS, who was in charge of the Station, and who deserves a special commendation for never once complaining during our six crowded months together, of the bird carcasses constantly at his elbow. I also wish to thank Major General Archer L. Lerch, and my immediate superior, Colonel Richard Martin, who gave me the assignment and made possible the gathering of the material for this study.

I collected in the Seoul-Suwon area of Kyonggi Do 492 specimens of 90 species of birds, and made field notes on several score more species as well that I was unable to collect. These specimens are all in the Museum of Comparative Zoölogy, and are so listed in the systematic portion of the work.

I was fortunate in having at Suwon the voluntary assistance of Mr. Shoju Kurozawa, a Japanese who had been head of the office staff of the Experiment Station, and who had been retained temporarily by Military Government to help indoctrinate the Koreans into the intricacies of office management. Kurozawa San spent the winter improving his English by making translations for me of every Japanese paper on Korean ornithology we were able to locate in the excellent libraries at our Station and the Forestry College in Suwon, and in the libraries of the LiWong Museum and the Chosen Natural History Society in Seoul as well.

I left Korea as suddenly and as unexpectedly as I had arrived there, not an uncommon experience in the military services. I received orders

late in April to report to Tokyo for reassignment, and left Suwon May 3rd for Japan. I spent only a week in Tokyo, making arrangements for future work there, and had no time to check on the Korean material in Japan. I returned home to Cape Cod for discharge, and spent my terminal leave unearthing Korean specimens in American museums, reviewing the non-Japanese literature, and writing a preliminary draft of this book.

I returned to Japan in September, 1946, as a War Department Civilian, in charge of the Wildlife Branch of the Natural Resources Section of GHQ in Tokyo. One of my first actions, after getting settled, was to find my old translator, Shoju Kurozawa, who had finally been repatriated. He came to work for me in Tokyo in November, and has been indispensable ever since, not only in duties connected with the official work of the Wildlife Branch, but in helping me run down items in the Japanese literature we had been unable to find in Korea, and in translating them for me. His knowledge of place-names in Korea has been particularly valuable.

Checking the Japanese bibliography for accuracy and completeness would have been impossible without the gracious and willing assistance of my Japanese ornithological friends. They helped me find many obscure items, some in languages other than Japanese, that I had missed. Thanks to them, the bibliography is just about as thorough as combined efforts can make it. Very few of the Japanese papers have ever been available to occidental ornithologists, or understandable when procurable. Hence I regard the review I have been able to make of them and include herein, as one of the most important single features of my work on Korea.

I am particularly indebted to Marquis Yamashina for his help and cooperation. He gave me free access to his museum, which was fortunately undamaged during the war. Though his home and most of the other buildings surrounding it were utterly demolished, the museum building was miraculously spared, and it now houses the most complete and the most valuable and useful reference material in Japan. The library contains, in addition to its wealth of Japanese works, practically all the important ornithological publications of America and Europe, and includes many rarities in occidental languages as well as in Japanese.

Yamashina had intended for many years to write a complete work on Korean birds, which was side-tracked partly by the war, and partly by his work on avian cytology. With this in mind he had gathered much unpublished Korean material, in holograph manuscript form, which he most generously made available to me, including a unique

copy of Won's "Handlist of Korean Birds" in which Won himself, at Yamashina's request, has inserted all the missing data for the specimens of his own collecting. Yamashina had also sent an assistant to Seoul, to procure the data on the specimens in the Seoul School and Scientific Society collections, missing from the published reports. Kuroda's and Taka-Tsukasa's secretaries had compiled for him holograph lists, with complete data, of all the Korean specimens in those two great collections, before they were destroyed.

Yamashina spent much time helping me to seek out other little-known and obscure source material, and to find and verify references. He went over his own specimens with me, interpreting and substantiating his views on Korean systematics. He has read much of the manuscript, and made constructive criticisms, corrections and suggestions.

Dr. Hachisuka, Marquis Kuroda and Prince Taka-Tsukasa have also read portions of the manuscript, made suggestions and corrections, and helped me to understand the Japanese ornithological point of view. Hachisuka checked all the English translations of Japanese I have quoted for accuracy of meaning and interpretation, a laborious task. Kuroda and Taka-Tsukasa supplied from their recollections many interesting historical details concerning their own, the Matsudaira and the Owston collections. Dr. Uchida unearthed for me all the Korean material in his collection at the Bird and Mammal Laboratories. To all my friends in Japan I acknowledge my indebtedness, and offer my thanks for their help, given whole-heartedly and unhesitatingly, frequently at considerable personal sacrifice and discomfort under, to them, the most trying of conditions.

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Tokyo, Japan,
10 April 1947.

SYSTEMATIC LIST OF SPECIES[1]

GAVIIDAE

1. Gavia stellata (Pontoppidan)

Colymbus Stellatus Pontoppidan, Danske Atlas, **1**, 1763, p. 621. (Denmark.)

English: Red-throated Loon.
Japanese: Abi (autochthonous.)

Specimen records:

Hamgyong Namdo — 17 Nov. 1914 (SSC).
Pyongan Namdo — 22 May, 18 Nov. 1932 (Won).
Kangwon Do — 25 April 1914 (LiWM).
Kyonggi Do — 10 Nov. 1911 (LiWM).
Kyongsang Namdo — 8 March 1885 (2)(USNM); 6 Apr. 1917 (2)(Kur).

The Red-throated Loon is a not uncommon winter visitor along the Korean coastline. It frequents the fresh water lakes more than the other species do, and when these freeze over, retires to the open waters of the tidal bays and estuaries. It never occurs in any numbers, but scattered individuals can usually be found in suitable locations from early November until April. Kuroda (1918, 496) observed it in Fusan Harbor 5 April, near Moppo 13 April, and in Wonsan Harbor 26 April. Won (1934, 109) considered it common.

A single Red-throated Loon in grey winter plumage came to the lake in Suwon 2 March 1946, shortly after the ice thawed, and remained for almost three weeks. I saw it daily until it departed 22 March. Another, an adult in full spring plumage, dropped in momentarily in transit on 7 April.

2. Gavia arctica viridigularis Dwight

Gavia viridigularis Dwight, Auk, **35**, 1918, p. 198. (Gichega, northeastern Siberia.)

English: Black-throated Loon.
Japanese: O-hamu (autochthonous.)

The Hand-List of Japanese Birds (1942) lists both this race and *G. a. pacificus* as occurring in Korea, but I can find no records referable to the latter form, and the Siberian race is the one logically to expect.

[1] An outline map of Korea, showing the provinces, will be found as a plate at the end.

This form is a rare winter visitor, though perhaps of more regular occurrence than the record indicates. There are only two specimens known from Korea, one in the LiWong Museum taken at Inchon, Kyonggi Do in December 1910, and one in the Seoul School Collection taken in Hamgyong Namdo, 20 November 1914.

3. Gavia adamsii (G. R. Gray)

Colymbus adamsii G. R. Gray, Proc. Zool. Soc. London, 1859, p. 167. (Alaska.)

English: White-billed Loon.
Japanese: Hashijiro abi (white-billed loon.)

There is but a single record of this species for Korea, a female in the LiWong Museum taken in Kangwon Do 7 April 1914. It should be a more regular winter visitor to the northeast coast than the record suggests.

COLYMBIDAE

4. Colymbus ruficollis poggei Reichenow

Colymbus nigricans poggei Reichenow, Journ. f. Orn., 50, 1902, p. 125. (Province of Chihli, China.)

English: Chinese Little Grebe.
Japanese: Kaitsuburi (autochthonous.)

Specimen records:

Hamgyong Namdo	— 15 Oct. 1912 (LiWM).
Pyongan Pukto	— Sept. (Kur).
Kangwon Do	— 1 Dec. 1914 (SSC).
Kyonggi Do	— 1 Nov. 1914 (LiWM); 20 Oct. (2), 3 Dec. 1927 (Taka); 24 Sept. 1929 (Won); 24 Oct. 1929 (SoM).
Cholla Pukto	— 31 Dec. 1911 (LiWM).
Kyongsang Namdo	— 21 Dec. 1914 (3)(LiWM); late Dec. 1922 (Kur).

This is the resident small grebe of Korea. It probably breeds there (though we have no proof thereof), and winters from Kyonggi Do southward, staying as long as there is open fresh water. Y. Kuroda and Miyakoda (1919) give its season in Kyonggi Do as April through October, but a better estimate is March through November. Yoshida (1923) saw it in Pyongan Pukto 22 July 1923, the only summer record.

There were five Little Grebes in Suwon Lake when I arrived there 7 December 1945, but they left before the ice formed a few days later. The first spring arrivals were three on 11 March 1946, and scattered individuals were present from then until I left in May, usually playing around the reed beds at the head of the pond. The largest number together at one time was eight on 5 April.

5. Colymbus auritus Linné

Colymbus auritus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 135. (Sweden.)

English: Slavonian Grebe.

Japanese: Mimi kaitsuburi (eared grebe.)

While further intensive field work may show this species to be of more regular occurrence, for the present it must be considered at best a rare transient or winter visitor. There are only two records, a male in the LiWong Museum taken in Kyonggi Do 8 November 1914, and a female in the Yamashina collection taken by Orii in Hamgyong Pukto 6 October 1929.

6. Colymbus nigricollis nigricollis (C. L. Brehm)

Podiceps nigricollis C. L. Brehm, Handb. Naturg. Vög. Deutschl., 1831, p. 963. (Germany.)

English: Black-necked Grebe.

Japanese: Hajiro kaitsuburi (white-winged grebe.)

Specimen records:

Hamgyong Pukto	— 26 Sept. 1917 (LiWM).
Kangwon Do	— 7, 8 April 1917 (LiWM).
Kyonggi Do	— 8, 23 Nov. 1914 (LiWM); 5 Dec. 1929 (Taka).
Cholla Namdo	— Dec. (Kur).
Kyongsang Namdo	— 10 Dec. 1883, 7 Dec. 1884 (USNM).

The black-necked Grebe is an uncommon spring and autumn transient along both coasts. A few may winter in the extreme south. I did not encounter it, and the only mention of the species in literature other than the specimen records quoted above is Kuroda's (1917, 2) sight record in Wonsan, Hamgyong Namdo, 26 April 1917.

7. Colymbus cristatus cristatus Linné

Colymbus cristatus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 135. (Sweden.)
English: Great Crested Grebe.
Japanese: Kammuri kaitsuburi (crowned grebe.)

Specimen records:

Kangwon Do	— 23 Nov. 1909, 14 Nov. 1914 (LiWM); April (SSC).
Kyonggi Do	— Nov., Dec. 1916 (SSC).
Cholla Namdo	— 3 Feb. 1915 (SSC).
Kyongsang Namdo	— March 1911 (SSC).

This grebe is an uncommon spring and autumn transient along the east coast, perhaps wintering off the south coast. Kuroda (1917, 496) saw one in "non-breeding plumage on the Naktung River, April 6" 1917, Kyongsang Namdo.

8. Colymbus griseigena holböllii (Reinhardt)

Podiceps Holböllii Reinhardt, Vidensk. Medd. naturhist. Foren. Kjöbenhavn, 1853, p. 76. (Greenland.)
English: Red-necked Grebe.
Japanese: Aka-eri kaitsuburi (red-naped grebe.)

Specimen records:

Kangwon Do	— 9 April 1914 (LiWM).
Cholla Namdo	— 3 Feb. 1915 (SSC).
Korea	— 1910 (LiWM).

This species is undoubtedly an uncommon but regular spring and autumn transient, despite the paucity of records. I saw two in spring plumage on the lake at Suwon 26 February 1946. While I could not get near enough to collect them, I was able to observe them at slightly over a hundred yards under excellent lighting conditions leisurely enough through my glasses to make identification positive.

DIOMEDEIDAE

9. Diomedea albatrus Pallas

Diomedea albatrus Pallas, Spic. Zool., **1**, fasc. 5, 1769, p. 28. (Off Kamchatka.)
English: Steller's Albatross.
Japanese: Ahodori (fool bird.)

Steller's Albatross is now virtually extinct, thanks to constant persecution by the Japanese on its main breeding grounds on Torishima. The common albatross of the waters off Korea today is *D. nigripes*, for which there are no Korean records whatever. *D. albatrus* was formerly a common visitor to coastal Korea, but as it seldom came within the outer islands it was seldom collected. The only specimen that might be attributed to Korea is one taken in Korea Straits off Fusan by Jouy 2 June 1885, and recorded by Clark (1910, 149). However, Kuroda (1923, 214) quotes a Japanese light-house keeper who was stationed at various places along the west coast as saying that while albatrosses [sp.?] were seen only occasionally at Chilbal Island in Cholla Namdo, there were very many of them on Sin Island near Yongampo in Pyongan Pukto on the Manchurian boundary. No mention is made of the species' former breeding there, though it is implied.

PROCELLARIIDAE

10. Puffinus leucomelas (Temminck)

Procellaria leucomelas Temminck, Pl. Col., livr. 99, 1835, pl. 587. (Seas of Japan and Nagasaki Bay.)

English: Streaked Shearwater.

Japanese: O-mizunagidori (large calm-water bird.)

Specimen records:

Pyongan Pukto — 9 July 1917 (4) (LiWM); 10 June 1917 (SSC).
Pyongan Namdo — 4 June 1932 (Won).
Cholla Pukto — 17 July 1916 (LiWM).
Cholla Namdo — 21 June 1922 (Kur); 18 Mar. 1930, 15 Mar. 1931 (Uch).
Kyongsang Namdo — 18 May 1884 (USNM).

This is the common shearwater of the waters surrounding Korea. It breeds on at least three islands off the west coast, Nishi (west) Island near Chinnampo, Hwanghae Do, Shichihatsu Island, southwest of Moppo, Cholla Namdo, and on islands (name unknown) off Kunsan, Cholla Pukto.

Kuroda (1923, 312) was told by the light-keeper at Nishi Island, who collected an adult and two eggs for him there 21 June 1922, that they arrive "From the last of March on, and lay eggs from late June to early July. They lay a single egg. The young leave the nest in

mid-October, and leave the island the end of October. At Chilbal Island, Cholla Namdo, there are many shearwaters and no black-tailed gulls, but here (Nishi) the gulls are many and the shearwaters few."

The LiWong Museum has fifteen eggs collected 17 June 1916 with the adult listed above off Kunsan, Cholla Pukto. In the Yamashina Museum are two eggs, undated, from Shichihatsu Island.

Hashimoto (1931, 1932) says they arrive at Shichihatsu in mid-March, start to lay in mid-June, the young hatch in mid-August, and leave the nest from mid-October to early December. He found dead young in the nests after heavy rains 28 October 1930. Kobayashi and Ishizawa (1938, 218) add, on information received from Hashimoto, that the Streaked Shearwater digs a burrow 30 cm to 250 cm long, 10 cm to 25 cm in diameter at the entrance. The single egg is laid in June or July; both sexes incubate; the incubation period averages 54 days; the young remain in the nest 66 days after hatching.

Puffinus tenuirostris tenuirostris (Temminck)

English: Slender-billed Shearwater.

Japanese: Hashiboso mizunagadori (thin-billed calm-water bird).

While the "shores of Korea" is given as part of the type-locality of this species (Temminck, Pl. Col., livr. 99, 1835, pl. 587) there is no record of a specimen taken anywhere in or near Korea. The bird breeds in the southern hemisphere, and is common enough as a summer visitor to off-shore waters near Japan. So, while it doubtless occurs within the territory under consideration, it must be considered as hypothetical until a specimen record is available.]

HYDROBATIDAE

11. Oceanodroma monorhis monorhis (Swinhoe)

Thalassidroma monorhis Swinhoe, Ibis, 1867, p. 386. (near Amoy, China.)

English: Swinhoe's Fork-tailed Petrel.

Japanese: Hime kuro umitsubame (Princess black sea-swallow.)

Specimen records:

Cholla Namdo — 20 June 1929, 5 June 1931 (Uch).

Despite the paucity of specimen records, this species is doubtless not uncommon off the south and west coasts of Korea. It breeds on Shichihatsu and Nishi Islands in Cholla Namdo, according to Koba-

yashi and Ishizawa (1938, 214), and there are eggs from there in the Kobayashi collection. Hashimoto (1931) observed their arrival at Shichihatsu 6 May 1929, 23 May 1930, and 2 June 1931, and says they began laying 12 July 1931, the young hatched 26 August, and left the nest 5 October 1931. Kobayashi and Ishizawa (*idem*) add further information received from Hashimoto, "Some birds used the old holes of *Puffinus leucomelas*, whilst some dig a hole about 20 cm to 1 meter deep under or between the rocks or close to the roots of grass or shrubs. The innermost part of the hole is lined with a few dead grasses and feathers, whilst some have no lining at all. . . . One egg forms the clutch. Incubation commences immediately after laying and both the female and the male take turns. . . . The incubation period in five cases is forty-one days on an average."

PELECANIDAE

12. Pelecanus crispus Bruch

Pelecanus crispus Bruch, Isis, 1832, col. 1109. (Dalmatia.)

English: Dalmatian Pelican.

Japanese: Garancho (autochthonous, also means a Buddhist temple.)

The Dalmatian Pelican is a straggler to Korea, taken only once, at Inchon, Kyonggi Do, on 3 November 1914 (Kuroda, 1916, 189). The specimen is in the LiWong Museum.

PHALACROCORACIDAE

13. Phalacrocorax carbo hanedae Kuroda

Phalacrocorax carbo hanedae Kuroda, Tori, **4**, 1925, 348 and col. pl of head. (Haneda, near Tokyo, Honshu, Japan.)

English: Japanese Cormorant.

Japanese: Kawa u (River cormorant.)

Specimen records:

Hamgyong Namdo	— 16 August 1880 (G & S).
Kangwon Do	— April (Kur).
Kyonggi Do	— Jan. (Kur); May 1909, 29 Nov. 1914 (LiWM).
Cholla Namdo	— 22 Feb. 1914 (SSC).
Korea	— Feb. 1912 (Taka).

The Japanese Cormorant is of uncertain status in Korea. Won (1934, 107) claims to have collected it in Pyongan Pukto and calls it common, but fails to list a specimen or date of collection. It may be a fairly regular visitor during migration, and it is not impossible that there is a breeding colony of the species, as yet undiscovered, somewhere within the territory. The bird is easily confused with Temminck's Cormorant, with which it sometimes associates elsewhere and which is common in Korea. Sight records for the latter may in some cases refer to this less common species.

14. Phalacrocorax capillatus (Temminck and Schlegel)

Carbo capillatus Temminck and Schlegel, in Siebold's Fauna Japonica, Aves, 1850, pl. 83. (Japan.)

English: Temminck's Cormorant.
Japanese: Umi u (sea cormorant.)

Specimen records:

Hamgyong Pukto — 29 Aug. 1917 (LiWM); 2, 20 Oct. 1929 (Yam).
Pyongan Pukto — 5 June 1917 (LiWM).
Kangwon Do — 18 Dec. 1926 (2) (Taka).
Kyonggi Do — 13 Nov. 2 Dec. 1910 (LiWM); 21 Oct. 1921, 21 Aug. 1933 (Uch); July, August 1883 (USNM); 29 Aug. 1928 (Won).
Cholla Namdo — undated (SSC).

This is the common cormorant of Korea, usually observed in spring and autumn migrations off the coast. A few winter among the southern islands.

Mori (1939, 9) says it breeds in the sea-bird colony at Rando (Egg Island) close to the Manchurian border on the northeast coast, but the 1942 Japanese Handlist either overlooks or else discredits the record, though Mori elaborates it by saying the species lays from three to five eggs per clutch late in May. Mori also says the species occurs on Yobdo, a sea-bird island off Pyongan Pukto, and intimates that it breeds there, too.

Kobayashi (1931, 73) saw five off Fusan 15 March 1931. Hashimoto (1937) observed small flocks of from 8 to 15 birds off Hachibi Island, Kyonggi Do, 18 October 1933, 9 October 1934, 20 April and 3 November 1936. The first one I saw on the lake at Suwon appeared 6 April 1946, followed the next day by a flock of nine which spent most of the day washing and preening out in the center. Two more single birds came there, one on April 12th, and the last on the 15th.

15. Phalacrocorax pelagicus pelagicus Pallas

Phalacrocorax pelagicus Pallas, Zoogr. Rosso-Asiat., **2**, 1811, p. 303. (East Kamchatka and the Aleutian Islands.)

English: Pelagic Cormorant.
Japanese: Hime u (princess cormorant.)

The Pelagic Cormorant is an uncommon transient visitor. Kuroda had the only west coast specimen, taken in Kyonggi Do 15 December 1924. There are four records from the east coast, all from Kangwon Do, one in the Seoul School Collection collected 1 December 1914, and three in the LiWong Museum, one on 1 April, the others taken 30 April 1914. Several winter records from Quelpart Island suggest that the species may winter more or less frequently along the southern Korean coast. It doubtless occurs more regularly than the specimen records indicate.

ARDEIDAE

16. Ardea cinerea jouyi Clark

Ardea cinerea jouyi Clark, Proc. U.S. Nat. Mus., **32**, 1907, p. 468. (Seoul, Korea.)

English: Jouy's Grey Heron.
Japanese: Ao sagi (blue heron.)

Specimen records:

Hamgyong Pukto	— 24, 29 Sept. 1929 (Yam).
Hamgyong Namdo	— 4 Nov. 1919 (SSC).
Pyongan Pukto	— 15 June 1912 (4) (AMNH); 7 June 1917 (LiWM); 9, 20 Apr. 1929 (Yam).
Pyongan Namdo	— 30 July 1932 (Won); 3 Aug. 1932 (SSC).
Kangwon Do	— 16 Aug. 1880 (G & S).
Kyonggi Do	— 4 July 1883 (USNM); May 1909 (3), 20 June 1915 (LiWM); 18, 20, 22 Apr. 1917 (Kur); 7 March, 8 Apr., 8 July, 9 Sept. 1927 (Taka); 29 May 1928 (SoM); 19 May 1928, 15 Oct. 1929 (Won); 15 Oct. 1929 (SSC); 1 March, 5, 15 April 1946 (MCZ).
Cholla Namdo	— 13 Apr. 1917 (2) (Kur); 23 Jan. 1930 (Yam).

The Grey Heron is an abundant summer resident in the plains areas. Next to the magpies, crows and House Sparrows, it is the most noticeable, obvious bird in the Korean ricelands. During the warmer

months one or more are always somewhere in sight standing sentinel-like in the paddies. Almost every village has its lone big tree supporting from three to thirty nests. The natives do not bother them (because the nests are so inaccessible) and the birds become quite tame.

In view of its abundance in Kyonggi Do today, it is interesting to note that Kalinowski found it rather uncommon ("assez rare") there in 1887. He noted (Taczanowski, 1888, 468) that it "nests in the colonies of white herons", which implies that in those days the species had not yet branched out to occupy lone-tree sites in the villages as it does so extensively today. It still nests among the white herons as it did sixty years ago, wherever there is a heronry, but by dint of expanding its nesting sites, it has apparently increased in abundance during the last half century.

The species is essentially a summer resident, and most of them migrate out of the country every autumn, but a few hardy stragglers winter from Kyonggi Do southward every year. Kalinowski (*loc. cit.*) speaks of seeing one in February. I saw my first one near Seoul 2 December 1945, and later found three more wintering in the open paddies between Suwon and Inchon throughout January and February.

The advance guard of spring migrants began to drift into the Suwon area late in February. A definite wave appeared 11 March, and three days later I found fifteen perched for the first time on a nesting tree. They kept on increasing during the rest of the month. By the first of April the population seemed to have reached its normal saturation point and nesting was well under way, every nesting site occupied to capacity, the birds busily carrying sticks, repairing the old nests.

There is a lag in nesting dates as one progresses northward. Kuroda (1917, 498) collected seven eggs from four nests on pine trees in a river delta in Cholla Namdo 13 April 1917. A set of Kyonggi Do eggs in the LiWong Museum is dated 23 April 1910. Kobayashi (1932) notes from Hwanghae Do that on 25 March "they have suddenly increased very much and begun to build their nests." I observed similar activities in Suwon, a scant hundred miles southward, about ten days earlier.

17. Ardea purpurea manilensis Meyen

Ardea purpurea var. *manilensis* Meyen, Nova Acta Acad. Caes. Leop. Carol., **16**, suppl., 1834, p. 102. (Philippines.)

English: Eastern Purple Heron.

Japanese: Murasaki sagi (purple heron.)

Shulpin has named a northern race, (*Phoyx purpurea ussuriana*, Ann. Mus. Zool. Acad. Sci. URSS., **28**, 1928, p. 399) of this heron which is said to breed at the mouth of the Lefa River in southern Ussuriland and has been observed on migration in spring in the Possiet Bay region. Meise recognizes this form tentatively and also records a breeding colony from Tzitzikar [=Tsitsihar?], Manchuria on the basis of a letter from Lukaschkin. Meise is unable to confirm the color characters claimed by Shulpin and his recognition was based chiefly on very slightly larger size. The 1942 Japanese Handlist synonymizes *ussuriana* with *manilensis* with the comment "older adult".

Specimen records:

Hamgyong Pukto — 24 Sept. 1929 (5 im.) (Yam); 1 Oct. 1929 (im. (MCZ).
Pyongan Namdo — 20 May 1917 (SSC); 25 May 1926 (Taka); 7 Oct. 1931 (Won).
Kangwon Do — 10 Nov. 1914 (LiWM).
Kyonggi Do — Oct. (Kur); Nov. 1909 (LiWM).
Korea — Oct. 1917 (Taka).

The Purple Heron reaches northern Korea occasionally in spring, and quite regularly as an uncommon autumn visitor. Possibly some of the latter are post-breeding wanderers from more southern breeding stations. The M.C.Z. specimen listed above has a wing of 362 mm. and is no larger than breeding birds from southern China.

18. Butorides striatus amurensis (Schrenk)

Ardea (*Butorides*) *virescens* var. *amurensis* Schrenk, Reise Amur Lande, **1**, pt. 2 1860 p. 441. (Amurland.)

English: Amur Green Heron.

Japanese: Sasa goi (*sasa* is bamboo-grass, *goi* the fifth imperial rank.)

Specimen records:

Pyongan Pukto — 26 May 1917 (LiWM).
Kyonggi Do — 17 Apr. 1911, 8 June 1909, 20 June 1915, 12 July 1917 (LiWM); 4, 20 Apr. 1917 (Kur); 5 June 1913, 20 June 1929 (SSC); 9 Sept. 1927 (Taka); 20 June 1927, 24 Sept. 1929 (Won).
Kyongsang Namdo — 10 June 1936 (SSC).

The Green Heron is an uncommon summer resident in Korea. Its rarity may be judged by the fact that neither Jouy, Kalinowski, Campbell nor Orii found it. Yet Cumming (1933, 50) writes it is "found as a summer resident over most of Korea, nesting near the valleys where it may find frogs and minnows and other food in the rice fields." Kuroda (1918, 499) says "the species is rare near Seoul." Won (1934, 103) says it breeds but is rare. Yamashina (1941, 963) lists no specimens but ventures "it breeds in Korea." The 1942 Japanese Handlist merely lists the species as occurring, not breeding, in Korea. Judging by the collection dates of the Korean specimens, and from the species' known breeding range in adjoining nearby areas, it should breed in Korea, but as yet we have no evidence to that effect.

19. Bubulcus ibis coromandus (Boddaert)

Cancroma Coromanda Boddaert, Table Pl. enlum., 1783, p. 54. (Coromandel.)
English: Indian Cattle Egret.
Japanese: Shojo sagi (orang-utang heron.)

This species is only a straggler in Korea. Three specimens are known; one in the LiWong Museum labelled "Korea" was probably taken prior to 1910 from its accession number; a mounted bird in the Seoul School Collection was shot in Kyonggi Do 14 July 1910; Kuroda (1917, 5) lists another as taken "outside the east gate of Seoul, May."

20. Casmerodius albus (Linné)

Ardea alba Linné, Syst. Nat., ed. 10, **1**, 1758, p. 144. (Europe.)
Ardea modesta J. E. Gray, Zool. Misc., 1831, p. 19. (India.)
English: Great White Egret.
Japanese: Dai sagi (great heron.)

The 1942 Handlist of Japanese Birds gives both races as occurring in Korea; the larger, Siberian-breeding *C. a. albus* as a wintering bird in the south and a migrant elsewhere, and the smaller *C. a. modestus* as the local breeding form, which is born out by the following:

Specimen records:

Casmerodius albus albus (wing over 410 mm.)

Kangwon Do — 7 April 1916 (SSC).
Kyonggi Do — March, 25 Nov. 1912, 20 Dec. 1914 (LiWM); May 1917 (2) (Kur); 15 Oct. 1928 (Won).

Chungchong Namdo — 20 April 1930 (Taka).
Cholla Namdo — 31 January 1930 (Yam).
Kyongsang Namdo — undated (2) (Kur).

Casmerodius albus modestus (wing under 390 mm.)

Hamgyong Namdo — 17 August 1885 (G & S).
Pyongan Pukto — 19 June 1917 (LiWM); 22 Apr. 1929 (4) (Yam); 18 May 1933 (Won).
Kyonggi Do — July 1886 (Tacz); May (Kur); 5 May 1914 (SSC); 28 March, 4, 8, 8 April 1946 (MCZ).

Y. Kuroda and Miyakoda (1919) give the species' occurrence in the Seoul area as from February to early November. The first one appeared at Suwon 12 March 1946, after which more arrived daily the remainder of the month. The wing lengths of the four I collected are 370, 370, 382 and 365 respectively, placing them all well within the *modestus* range.

I neither observed nor collected *albus*, but I found *modestus* a common summer resident in Kyonggi Do, second in numbers only to the Grey Heron. Near its rookeries it is far more abundant than the latter in the surrounding paddies where both feed. The Egret tends to nest in huge colonies, whereas the Grey Heron is spread evenly in smaller colonies, all over the plains area. The center of distribution for all the white herons in the Suwon area is a large rookery in the King's Forest, just south of the air field. When I first visited it on 8 April I found several thousand pairs carrying nesting material and going through their courtship display. The nests were all high up on large trees, from 50 to 150 feet above the ground. The main rookery covered five or six acres, hardly a tree within which did not support from one to a score of nests.

There is a large colony on a mountain-side in Yonbaek county, Hwanghae Do, where they have been undisturbed by the native villagers for a number of years, and of which Professor Mori (1939, 8) writes "White herons were not common there formerly, but now over ten thousand of them can be found in June and July. The eastern slope of Mt. Tomi becomes as white as if snow-covered when they gather there. More than twenty nests can be found on some trees."

21. Egretta garzetta garzetta (Linné)

Ardea Garzetta Linné, Syst. Nat., ed. 12, **1**, 1766, p. 237. (Oriente, *ex* Brisson.)

English: Snowy Egret, Little Egret.
Japanese: Ko sagi (little Heron.)

This species is a straggler in Korea, the only definite record being a female I collected at Suwon 30 March 1946. Kuroda's note (1918, 498) "it is said that dorsal plumes of [this] species were once procured by a native in the northern part of Corea" is probably referable to *Egretta eulophotes* (Swinhoe).

22. Egretta eulophotes (Swinhoe)

Herodias eulophotes Swinhoe, Ibis, 1860, p. 64. (Amoy, China.)

English: Chinese Egret.

Japanese: Karashira sagi (Chinese white heron.)

Specimen records:

Pyongan Pukto — 12 June 1917 (SSC); 5, 30 June 1917 (LiWM); 2 July 1918 (Kur); 30 April 1929 (Yam).

Kyongsang Pukto — 25 April 1886 (USNM).

The Chinese Egret seems to be a locally common summer resident in northern Korea. Its superficial similarity to two other species has led to some confusion in literature. The two LiWong specimens were misidentified and listed by Shimokoriyama (1917, 4) as Reef Herons, *Demigretta sacra*, for which there are no Korean records. Won (1934, 103), though he refers to earlier Pyongang Pukto specimens, never collected it himself and was unaware of Mori's findings (see below). He evidently did not know the bird, though it seems to be not uncommon in an area supposedly familiar to him. On the other hand, he collected in Pyongan Pukto 21 August 1932 a heron which he identified as the Plumed Egret, *Mesophoyx intermedia*, a species he had collected previously in Kyonggi Do, and which he says is common and breeds at Yonghung in Hamgyong Namdo. This does not agree with the findings of others for that species, and is apparently ignored by the Japanese Handlist. While their identity is doubtful, and impossible to determine without further evidence, Won's Pyongan Pukto specimen and his Hamgyong Namdo breeding reference are very likely attributable to the Chinese Egret.

Mori (1939, 11) gives the following account of the breeding of this species on Yobdo (Yob Island), a solitary islet off the northwest coast of Pyongan Pukto: "Black-tailed Gulls are most numerous [there], followed in numbers by Chinese Egrets, Horn-billed Puffins and Cormorants. . . . The rookery is deserving of special attention because the Chinese Egret breeds there. This is a white heron which

does not breed in Japan. Women are very fond of eating its eggs, for it is believed it makes their skin beautiful. Many of them [referring to the birds again] live on the northwest coast of Korea and breed there. They build their nests in a shrub with dry grass. In the middle and last of May they lay from three to five eggs."

[*Demigretta sacra* (Gmelin)

English: Reef Heron.
Japanese: Kuro sagi (black heron).

While it is possible this species has occurred in Korea as a straggler, there is no unquestionable specimen record. The two LiWong specimens listed by Shimokoriyama (1917, 4) were misidentified *Egretta eulophotes* from Pyongan Pukto. Kuroda had a specimen which (holograph list) was "bought in a stuffing shop in Seoul" without data. The LiWong Museum has three specimens from Quelpart Island, properly identified and listed. Jouy collected it at Tsushima, and Orii found it at Quelpart. Yamashina (1941, 949) sums up the case as follows: "it is doubtful if this bird occurs in Korea. Kuroda's and Momiyama's specimens say 'collected in Korea' but the locality is not certain. It is common on Quelpart."]

23. Mesophoyx intermedia intermedia (Wagler)

Ardea intermedia Wagler, Isis von Oken, **22**, 1829, col. 659. (Java.)

English: Plumed Egret.
Japanese: Chu sagi (middle-sized heron.)

Specimen records:

Kyonggi Do — undated, 19 April 1917 (Kur); 19 June 1912 (SSC); Aug. 1928 (SoM); 2 Oct. 1929 (Won); 30 April 1930 (Taka).
Korea — 1909 (LiWM).

Though this heron breeds near by in China and Japan, it is of uncertain status in Korea. Kuroda's statement (1918, 497) that it "is a common summer resident in the middle parts of Corea" is neither substantiated nor corroborated by any other investigator. Won's comment (1934, 103) that it is common and breeds at Yonghung in Hamgyong Namdo, as well as the identity of his Pyongan Namdo specimen (see under *Egretta eulophotes*) is seriously open to question. From the evidence at hand, the species can be considered as little more than a straggler, though later investigations may show localized breeding colonies in central Korea.

24. Nycticorax nycticorax nycticorax (Linné)

Ardea Nycticorax Linné, Syst. Nat., ed. 10, **1**, 1758, p. 142. (southern Europe.)

English: Night Heron.

Japanese: Goisagi (sagi means heron; goi is the fifth imperial rank, but is used loosely for herons and bitterns. A Japanese legend says the night-heron was raised to the peerage by a feudal emperor in gratitude for decorating a new artificial pond on his palace grounds with its presence.)

The Night Heron is a rare straggler, of which there are only three records for Korea. Mori (1929, 107) reports a specimen taken at Kyongsong, Hamgyong Pukto in 1925. Two birds taken in Cholla Namdo 28 May 1926 and 1 June 1928 were sent in the flesh to the Bird and Mammal Laboratories of the Ministry of Agriculture and Forestry in Tokyo. They were identified by Uchida, but were too decomposed when received to be preserved.

25. Ixobrychus sinensis sinensis (Gmelin)

Ardea sinensis Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 642. (China.)

English: Least Bittern.

Japanese: Yoshi goi (marsh-reed bittern.)

There are three records for this straggler in Korea. Taczanowski (1888, 458) reports a female Kalinowski collected near Inchon 29 May 1888. Taka-Tsukasa had one from Kyonggi Do, 20 Sept. 1926. A specimen taken in Cholla Namdo 27 May 1925 is in the Uchida collection at the Bird and Mammal Laboratories of the Ministry of Agriculture and Forestry, Tokyo.

26. Ixobrychus eurhythmus (Swinhoe)

Ardetta eurhythmus Swinhoe, Ibis, 1873, p. 74, pl. 2. (Amoy, Shanghai.)

English: Shrenk's Little Bittern.

Japanese: O yoshi goi (large marsh-reed bittern.)

Specimen records:

Hamgyong Pukto — 24 May 1912 (AMNH); 7 July 1934 (SSC).

Pyongan Pukto — 26 May 1917 (4) (LiWM); May-June 1917 (3) (Kur); 17 May 1917 (SSC); 19, 20 June 1917 (Taka); Jan. 1929 (SoM); 20–24 May 1929 (6) (Yam).

Pyongan Namdo — 29 Aug. 1933 (Won).
Kyonggi Do — 30 Apr. 1930 (2) (Taka).
Cholla Namdo — 28 Sept. 1928 (Uch).

This bittern is evidently a fairly common summer resident in the northern provinces. Won (1934, 104) says it is common and that it breeds there. The 1942 Japanese Hand-List also lists it as breeding in Korea, though there is no more evidence of its nesting than the collecting dates and the fact that it is known to breed in both China and Japan.

27. Botaurus stellaris stellaris (Linné)

Ardea stellaris Linné, Syst. Nat., ed. 10, **1**, 1758, p. 144. (Europe.)
English: Bittern.
Japanese: Sankano goi (house-in-the-mountains bittern.)

Specimen records:

Pyongan Namdo — 10 Apr. 1932 (Won).
Kyonggi Do — 12 Oct. 1913 (LiWM); 20 May 1918, 26 Apr. 1929 (SSC); 20 Sept. 1925, Nov. (Kur); 15 Oct., 20 Nov., 25 Dec. 1926 (Taka); Nov. 1934 (SoM).
Cholla Namdo — 26 March 1913 (LiWM).

From the record, the Bittern appears to be an irregular visitor to Korea. Won (1934, 104) calls it rare, but Yamashina (1941, 997) says it is "not rare in migration season and winter."

CICONIIDAE

28. Ciconia ciconia boyciana Swinhoe

Ciconia boyciana Swinhoe, Proc. Zool. Soc. London, 1873, p 513. (Yokohama.)
English: Japanese Stork.
Japanese: Konotori (autochthonous, but means "this bird".)

Specimen records:

Hamgyong Namdo — Sept. 1889 (Camp).
Hwanghae Do — 6 Jan. 1917 (SSC); 15 Nov. 1923 (Kur); 15 Dec. 1926, 17 March 1927 (Taka); 20 March 1929 (Won).
Kangwon Do — 15 Jan. 1919 (Taka); Apr. 1931 (Sendai Mus.).

Kyonggi Do — 21 Feb. 1889 (Camp); Feb. 1909, 20 Feb. 1913 (LiWM); undated (SoM); Feb. 1936 (USNM).
Chungchong Namdo — 28 Dec. 1918 (Taka); Dec. 1924 (Kur).
Kyongsang Namdo — 3, 15, 21 Dec. 1883 (USNM).

The Japanese Stork is a locally common resident in Korea, particularly in Hwanghae Do. A few winter. The numerous sight records in literature are quite acceptable, for the bird cannot be mistaken for anything else. It is well known in Korea, and considered a good-luck omen. Campbell (1892, 244) says it "is not uncommon. It is by no means shy, and is easily approached and killed in the rice-fields." Yoshida (1923, 316) observed it at Ongjin, Hwanghae Do, 12 July, the only summer record. Y. Kuroda (1919, 148) saw a flock of eight birds near Goryndo railroad station (between Seoul and Inchon) 3 March 1918.

Kobayashi (1932, 70) writes from Hwanghae Do, 25 March, "There are two places here where storks nest. One of them is now under construction, but in the other they have already laid their eggs." At the same place the previous year (1931, 75) he first saw two on 19 March, of which he says "I found a stork feeding and, following it, found its nest as I expected on a 'Yachimado' tree, fifty feet from the ground. The nest proper, built entirely of dead branches, I estimated as ten feet in diameter. Two eggs were being incubated. The Koreans say they nest at this same place every year, and as they are a good omen, are well protected." From another village he wrote a week later, 26 March, "Storks had been nesting on a pine tree near a dwelling for more than ten years, but this year they moved their nest to a nearby chestnut as the peasant had destroyed the old nest. I could not understand his action and asked him 'why did you destroy the nest regardless of the Korean belief that it is a good omen?' He replied 'the storks carry snakes as food for their baby birds and drop the bones under the tree. My child was injured by stepping on them'."

Professor Mori (1939, 8) notes "While very few Japanese Storks are now found in Japan proper, they may still be found in many places in Korea, though greatly decreased. Quite a few of them nest in Yonan and Haeju counties in Hwanghae Do. They do not build their nests congregated in tight colonies. The individual nests are at least several 'cho' [119 yards] apart. They are usually scattered at the rate of one nest to one village. . . .

"Usually the nests are built about ten meters high on a big tree, zelcora, ginko, ash or pine, over three or four meters in circumference. The nests are about two meters in diameter, fifty centimeters deep,

and flat, sphere-shaped. The material of the nests consists of various dead branches; thick down and dry grass is laid in the center.

"As people protect the nest as a good omen, many nests can be found near dwellings in Hwanghae Do. Mr. Cho Nak Chun, an old man 76 this year, living at Hansadong, Yonbaek county, finding a Japanese Stork more than ten years ago, the first migrant to that locality, persuaded the people of the village not to molest it, and has protected the birds ever since. Now the nests have increased to three, and some of the birds stay there in winter. Usually the stork migrates south in autumn. . . .

"The stork lays about five eggs to the clutch in March, and they hatch in April. The baby chicks are most appealing when they are waiting for their parents, opening their big mouths for food. The parents and chicks live together in the nest until summer. When autumn comes most of them pay no more attention to the nest and it becomes ruined. Most of them migrate to a warm district when winter approaches. They feed on fish, shellfish, insects and other animal-like food."

He recommends protecting stork breeding grounds at eight specified localities in Hwanghae Do, six in Yonbaek county and two in Haeju county.

29. Ciconia nigra (Linné)

Ardea nigra Linné, Syst. Nat., ed. 10, **1**, 1758, p. 142. (northern Europe.)

English: Black Stork.

Japanese: Nabeko (autochthonous, but means "pot stork".)

Specimen records:

Hamgyong Pukto — 17 Sept. 1917 (LiWM); 25 Aug. 1920 (SSC).
Kyonggi Do — 20 Oct., 30 Dec. 1910, 20 Oct. 1914 (LiWM).
Chungchong Pukto — 21 Oct. 1928 (Y. Kur).
Kyongsang Namdo — 3 Jan. 1909 (Taka).

The Black Stork is a rare summer resident in Korea, known to breed only in Kyongsang Pukto. Professor Mori (1938, 127–129) tells of a trip he made in late March, 1939, to Andong, Kyongsang Pukto to investigate a reported nesting of the species near there. After an arduous, all-day trip from Andong, climbing over two mountain passes, he finally reached "the isolated mountain village of Kashodo, a hamlet of less than ten houses. A small plain opens around this village, in the midst of which towers an odd-looking mountain called 'Kozan.'

The Rakuto River flows in front of the village, and on the opposite bank on the side of a cliff, some thirty meters from the ground, we observed a nest built with twigs in the crevices of the rocks, similar to but smaller than that of the Japanese Stork. . . .

"There seems to be a difference in habit between the Black Stork and the Japanese Stork. The former builds its nest in crevices of cliffs and perches chiefly on high rocks. The latter, on the other hand, builds its nests on the tops of large trees, and in Korea close to human habitation, and perches on trees instead of rocks.

"Unfortunately we were unable to approach the nests since they were half way up the cliff. We observed a Black Stork flying majestically in the sky . . . and waited for it to come down, but unfortunately it perched on a rock on the very top of the jagged cliff. We tried to take a picture of it at close range, but it would not let us approach it. According to the local people, they stay near their nests all year round in warm years, but in cold years fly south during winter. They search for food in ones or in twos in the shallows of the Rakuto river or in the rice fields, hunting fish or frogs. They lay and hatch their eggs in May or June."

He revised these statements slightly when he published his conservation booklet the next year. Speaking of the same place he writes (1939, 8) "The local people call this bird 'hyun hak' (black crane) and the cliff where they nest 'hak so tae' (crane-nest plateau). They say the birds sometimes stay there all year round, and lay five eggs, more or less, in March and April. The Black Cranes have evidently lived there since feudal days, for the famous Confucian scholar, Li Taege (1501–1570) wrote a poem about the birds when he visited this spot about four hundred years ago."

THRESKIORNITHIDAE

30. Nipponia nippon (Temminck)

Ibis nippon Temminck, Pl. Col., livr. 93, 1835, pl. 551. (Japan.)

English: Japanese Crested Ibis.

Japanese: Toki (autochthonous, but the Chinese characters mean vermilion heron.)

Specimen records:

Hamgyong Pukto — Sept. (Kur).

Hamgyong Namdo — Dec., Jan. 1887–1888 (4) (Tacz); 1, 3 Apr. 1929 (Kur).

Pyongan Pukto	— Feb. 1930 (Sendai Mus).
Hwanghae Do	— Nov., Dec. 1911 (Kur); 7 Dec. 1913 (SSC).
Kyonggi Do	— Dec., Jan. 1889 (Camp); May, Nov. 1909, 25 Oct. 1913, 30 Nov. 1910 (LiWM); Dec. 1913 (Taka); Jan. 1921 (Kur); 1 Oct. 1923 (SoM).
Chungchong Pukto	— 19 Nov. 1910 (LiWM).
Chungchong Namdo	—Jan. 1928 (SSC).
Cholla Pukto	— 21 Dec. 1911 (LiWM).
Kyongsang Namdo	— 17 Dec. 1883 (USNM).
Korea	— 19 Oct. 1912, Feb. 1914 (Taka).

The Crested Ibis is a locally common transient or winter visitor, much rarer today than formerly. Taczanowski (1888, 468) wrote "one begins to find it winter and spring fifty kilometers north of Seoul, commonest around Wonsan where one encounters flocks of about fifty individuals. In summer one does not see it in Korea." Campbell (1892, 244) found it "common in winter and spring. I once saw as many as a dozen perched in a grove of pines, but I usually observed it in dry rice paddies. It is a stupid, unsuspicious bird, and falls an easy prey to the gun", which perhaps partially explains its scarcity today.

Since the nineteenth century there have been few such reports. Shimokoriyama (1913, 113) in the autumn of 1911, somewhere on the Chungchong Namdo-Cholla Pukto boundary, encountered a flock of several thousand roosting in pine trees near a pond, evidently his first and only such experience. He collected several of them. Won (1934, 103) claims to have collected it in Pyongan Namdo and Kyonggi Do, but supplies no further data. Hashimoto (1937) saw a flock of twenty birds fly by Hachibi Island, Kyonggi Do 2 April 1934, and a single bird in the same place 16 May 1936. Yamashina (1941, 905) lists three Korean specimens, two white and one grey phase, and comments "small flocks can be encountered in many localities, but breeding places not yet found."

31. Platalea leucorodia major Temminck and Schlegel

Platalea major Temminck and Schlegel, in Siebold, Fauna Japonica, Aves, 1849, p. 119, pl. 75. (Japan.)

English: Japanese Spoonbill.
Japanese: Hera sagi (spatula heron.)

This spoonbill is a straggler to Korea, known only from one definite record. Yamashina (1941, 896) has an immature male in his collection

taken in Kyongsang Namdo 13 February 1937. The only other reference to the species in literature is Kuroda's note (1918, 499) under *Platalea minor* that "it is said that *P. leucorodia* occurs in S. Corea."

32. Platalea minor Temminck and Schlegel

Platalea minor Temminck and Schlegel, in Siebold, Fauna Japonica, Aves, 1849, p. 120, pl. 76. (Japan.)

English: Black-faced Spoonbill.

Japanese: Kurotsura herasagi (black-faced spatula-heron.)

Specimen records:

Hamgyong Pukto — Jan. 1910 (Yam).
Pyongan Pukto — 5 June, 3 July 1917 (LiWM); 23 Apr. 1929 (Yam); 7 Oct. 1931 (SoM); 17 June 1933 (Won).
Pyongan Namdo — 14 May 1917 (SSC); 10 Dec. 1929 (Taka); 15 Oct. 1931 (Won).
Kyonggi Do — 18 Oct. 1914 (LiWM).
Cholla Pukto — 27 March 1914 (LiWM).
Kyongsang Namdo — 7 Dec. 1884 (USNM).

The Black-faced Spoonbill is a locally common summer resident, arriving in March and departing in November. It breeds on small off-shore islets in Cholla Pukto, and probably in coastal Pyongan Do. Kuroda (1918, 499) obtained six eggs collected at Ito, Cholla Pukto, 22 July 1917, and there are several more eggs in the LiWong Museum from a small island off the coast of Cholla Pukto 17 July 1916. Won (1934, 102) calls it common and breeding.

ANATIDAE

33. Cygnus cygnus cygnus (Linné)

Anas cygnus Linné, Syst. Nat., ed. 10, 1, 1758, p. 122. (Sweden.)

English: Whooping Swan.

Japanese: O hakucho (large swan.)

Specimen records:

Hamgyong Namdo — 7 Nov. 1914 (SSC).
Pyongan Pukto — 5 Apr. 1934 (Won).

Hwanghae Do	— early Apr. 1921 (Kur).
Kyonggi Do	— March 1910 (LiWM).
Cholla Pukto	— 19 Nov. 1910 (LiWM).
Cholla Namdo	— Dec. 1902 (USNM); 23 Feb. 1927 (Taka).
Kyongsang Namdo	— 16 June 1912 (AMNH).

This species is a transient and winter visitor to Korea, not as common as Bewick's Swan by my observations on the west coast, but said by Mori (1939, 9) to be the most abundant of the swans on the east coast. Campbell (1892, 245) says "In mild seasons I have noticed that a number of these swans pass the winter in a bend of the Han River, about three miles south of Seoul." Taczanowski (1888, 460) quotes Kalinowski's observation that it is "the most common in winter", but whether he means of the swans or the seasons is unclear.

In the several flocks of swans I encountered during March near Suwon, I was able positively to identify only a few Whoopers among the Bewicks. While there seemed usually to be a few markedly larger individuals in the groups, I could seldom approach close enough to distinguish the bill character, and the greater part of them appeared to be *bewickii*, as is the only one I collected.

34. Cygnus bewickii jankowskii Alpheraky

Cygnus bewickii jankowskii Alpheraky, Priroda i Okhota, Sept. 1904, p. 10. (Ussuri.)

English: Eastern Bewick's Swan.

Japanese: Hakucho (autochthonous, but means white bird.)

Specimen records:

Hamgyong Namdo	— 11 Jan. 1919 (Taka).
Kangwon Do	— Dec. (Kur); 22 Nov. 1914 (SSC); Dec. 1928 (SoM).
Hwanghae Do	— Oct. 1928 (Won).
Kyonggi Do	— April 1909, 10 Nov. 1914 (LiWM); 19 March 1946 (MCZ).
Cholla Namdo	— Nov. 1918 (Taka).
Kyongsang Namdo	— Feb. (G & S).

Bewick's Swan is a common transient and not uncommon winter visitor to Korea. Y. Kuroda and Miyakoda (1919, 150) say it occurs in the Seoul region from mid-October to mid-December and from mid-February through late April, "most numerous from late March to early April". I encountered the first flock near Suwon on 1 March

1946, an impressive array of 250 birds feeding in an open brackish inlet. I found smaller flocks throughout March at the heads of the bays, the last being eight on 31 March.

Mori (1939, 9) gives the following account: "Swans are seldom seen in Japan nowadays, but in Korea great flocks, though decreased compared to olden times, still migrate to several localities, such as Ongjin and Changyon Kuns, Hwanghae Do, and Chaho, Hamgyong Namdo. They move further south in colder seasons. The ponds in Changryong and Hyopchon Kuns, Kyongsang Namdo, and the seacoast of Chindo Kun, Cholla Namdo, are their wintering grounds.

"In Hyopchon and Changryong the people say that a heavy migration of these birds is an augury of a good crop, so the birds are well protected there. We can frequently see flocks of several hundred birds at ponds in these districts. Most of them are Whooper Swans, with Bewicks and Mute Swans with them. They feed on water plants, shoots of weeds, fish, shellfish, aquatic insects in the ponds or at the seacoast. The ponds in Hyopchon and Changryong Kuns are protected by law."

35. Cygnus olor (Gmelin)

Anas Olor Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 502. (Russia.)

English: Mute Swan.

Japanese: Kobu hakucho (wen swan.)

The Mute Swan is an uncommon winter visitor to Korea. Mori (1939, 9) mentions it as the least common of the swans in Kyongsang Namdo (see under *Cygnus bewickii*). Taka-Tsukasa and Hachisuka (1925, 906) say it "is found rarely in Corea", and note that there are no records for it elsewhere in the old empire. There are only three certain Korean records. Kalinowski collected a young female at Wonsan 27 February 1888, of which Taczanowski comments (1888, 458) "our voyageur saw only immature birds in this country (Hamgyong Namdo) in winter; the adults go farther south, but return toward the 20th of February". Kuroda (1917, 15) reports one from Moppo, Cholla Namdo in January. There was a specimen in the Seoul School Collection taken 13 December 1918 in Chungchong Namdo.

36. Chen hyperborea (Pallas)

Anser hyperboreus Pallas, Spic. Zool., fasc. 6, 1769, p. 31. (northeast Siberia.)

English: Snow Goose.

Japanese: Haku gan (white goose.)

The Snow Goose is a straggler to Korea. The lone Korean record, published by Kuroda (1918, 290), is a bird taken in Cholla Namdo in January, 1917. The specimen was formerly in the Momiyama collection, but was destroyed by the 1923 earthquake.

37. Anser albifrons albifrons (Scopoli)

Branta albifrons Scopoli, Annus I, Hist. Nat., 1769, p 69. (northern Italy?)

English: White-fronted Goose.
Japanese: Magan (true goose.)

Specimen records:

Pyongan Pukto	— 4–15 Apr. 1929 (3) (Yam).
Hwanghae Do	— March (Kur); 25 Oct. 1930 (Won).
Kyonggi Do	— March, May 1909, Feb. 1910 (LiWM); 15 Oct. 1925 (SoM); 13 Feb. 1918 (SSC).
Chungchong Namdo	— 3 Jan. 1913 (SSC); 16 Dec. 1926 (3) (Taka).
Cholla Pukto	— Jan. 1929 (Kur).
Cholla Namdo	— 13 Dec. 1929 — 10 Feb. 1930 (4) (Yam); 29 Jan 1927 (3) (Taka).
Kyongsang Namdo	— Feb. (G & S); 12 Nov. 1883, 13 Mar. 1885 (USNM); 2 Feb. 1929 (Kur).

The White-fronted Goose is a common transient and winter visitor in Korea, not quite so plentiful, however, as the Bean Goose. Y. Kuroda and Miyakoda (1919, 150) give its Seoul seasons as "late February to early April; October and November", commenting that it "migrates early" in comparison with the other species, which was most certainly true in my own experience.

I saw my first geese near Suwon 23 February 1946, a flock of 60 composed entirely of *albifrons*, and the species was most plentiful during the first ten days of March. Soon thereafter its place in the flocks was rapidly assumed by the Bean Goose, and I observed none after 20 March, when there was one gaggle of 40 birds in a group by themselves among a mass of some 1500 individuals of other species.

38. Anser erythropus (Linné)

Anas erythropus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 123. (Sweden.)

English: Lesser White-fronted Goose.
Japanese: Karigane (reaping goose.)

Straggler. The only Korean record for this species is Kuroda's note (1918, 504) that "Mr. Yasukichi Kuroda has shot two birds from a group of this species at Dasenjo, Keki Distr. [Kyonggi Do], early in April, 1917". However, he notes sixteen years later (1934, 283) that these specimens are "no longer in existence."

39. Anser fabalis (Latham)

Anas Fabalis Latham, Gen. Syn. Suppl., **1**, 1787, p. 297. (Great Britain.)
Melanonyx arvensis sibiricus Alpheraky, Geese Europe and Asia, 1905, p. 104, pl. 10, 23. (East Siberia.)
Anser segetum var. *serrirostris* Swinhoe, Proc. Zool. Soc. London, 1871, p. 417. (near Amoy, China.)

English: Bean Goose.
Japanese: Hishikui (eater of water-chestnuts.)

Authorities still disagree on the racial arrangements within this plastic species, and the matter will never be settled satisfactorily until there is adequate comparative breeding material at hand for study. To attempt to throw further light on the question with material collected on the wintering grounds or in migration is futile. The Japanese have assigned various Bean Geese collected in Korea to almost every race that has been described. But aberrant individuals occur in every group of birds, and the recognition of the occurrence of a race within so variable a species on the basis of one or two lone specimens is rather questionable.

The Korean Bean Geese seem to fall into two races, a larger, longer-billed form, *Anser fabalis sibiricus,* and a smaller, thicker-billed form, *Anser fabalis serrirostris,* both breeding in Siberia, the former more northerly and easterly. There are many intermediates impossible to assign to either race. I collected a male 17 March 1946 which is definitely *serrirostris,* and measured three more in the field which were shot for the table, two of which were also *serrirostris,* and the third just as positively *sibiricus.* As the collection dates show no apparent distinction in times of occurrence of the various subspecies, the following specimen records are given without racial separation.

Specimen records:

Hamgyong Pukto	— 20 Sept., 12 Oct. 1929 (5) (Yam).
Hwanghae Do	— 20 March 1914 (SSC); 30 Mar. 1927 (2) (Taka); 25 Oct. 1930 (Won).
Kangwon Do	— 30 Sept., 1 Oct 1914 (LiWM).

Kyonggi Do — Mar. 1909, Jan. 1911, Feb. 1915 (LiWM); 14 Jan. 1913 (Kur); 15 Mar. 1929 (SoM); 28 Mar. 1927 (6) (Taka); 18 Mar. 1932 (USNM); 18 Feb., 15 Mar. 1929, 20 Mar. 1932 (Won); Dec. 1935 (2) (Uch); 17 Mar. 1946 (MCZ).
Chungchong Namdo — 20 Jan. 1914 (LiWM); 22 Nov. 1917 (Kur).
Cholla Namdo — Dec. (Kur); undated (SSC); 12 Feb. 1930 (Yam).

The Bean Goose is a common transient and winter visitor to Korea, the most abundant of all the geese. Y. Kuroda and Miyakoda (1919, 150) give its season near Seoul as March through mid-April, October and November. I observed the first one 3 March, and the main flight began to come through a week later. On 17 March I encountered a flock of about 1500 birds, and the movement continued the rest of the month. My notes contain references to many flocks of from 100 to 200 birds, both in brackish waters near the shore, on the flats at low tide, at the heads of the inlets, and inland on the rice paddies and in the fresh water lakes. Frequently two sizes of birds could be seen together, each seemingly keeping in a knot by itself, but the subspecific identification of the various gaggles by sight in the field is virtually impossible.

40. Cygnopsis cygnoid (Linné)

Anas Cygnoid Linné, Syst. Nat., ed. 10, **1**, 1758, p. 122. (Asia.)
English: Swan Goose.
Japanese: Sakatsura gan (inverted-faced goose.)

Specimen records:

Hamgyong Pukto — 29 Sept. 1929 (2) (Yam).
Pyongan Pukto — 7, 10 Apr. 1929 (Yam).
Pyongan Namdo — 21 March 1933 (SSC); 19, 21 March 1932 (Won).
Hwanghae Do — March (Kur).
Kyonggi Do — 15 Mar., Apr. 1914 (LiWM); 26 Mar. 1927 (Taka).
Cholla Namdo — undated (SSC); 20 Dec. 1926 (2) (Taka).

The Swan Goose is a common transient, more plentiful in spring than in autumn, but never as abundant as the Bean Goose or the White-fronted Goose. Y. Kuroda and Miyakoda (1919, 150) give its season near Seoul as mid-March through April, and October and November, adding "this bird migrates later than other geese. When these are common, the others have decreased. We took three birds in

mid-April 1913. They were eating carrots. We saw none later." Kuroda (1918, 504) "observed a group of some ten birds of this Goose near Riugan-po [Pyongan Pukto] May 3." He also notes (*idem*) "It is said that the species breeds on the Shinto Island in the mouth of the Yalu River [Pyongan Pukto]", but this rumor is unverified by either Won or Orii, both of whom worked subsequently in that area.

I observed the first arrivals 17 March 1946, a small group of eight which kept to themselves at the edge of a flock of several hundred of the other two species, near Suwon. They became comparatively more common toward the end of the goose flight, and I last saw the species 1 April.

41. Branta bernicla nigricans (Lawrence)

Anser nigricans Lawrence, Ann. Lyc. Nat. Hist. N. Y., 4, 1846, p. 171, pl. 12. (Egg Harbor, New Jersey, U.S.A.)

English: Black Brant.
Japanese: Koku gan (black goose.)

Specimen records:

Pyongan Namdo	— 24 Mar. 1910 (LiWM).
Chungchong Namdo	— 15 Jan. 1915 (SSC).
Cholla Namdo	— Dec. (Kur); undated (SSC); 11 Jan. 1930 (2) (Yam).
Kyongsang Namdo	— 24 Dec. 1914 (LiWM); 12 Feb. 1912 (AMNH).
Korea	— 10 Feb. 1921 (Uch, *ex* Matsudaira).

The specimen records above are the only information at hand on the occurrence of this species in Korea. It is probably best regarded as an uncommon winter visitor.

42. Casarca ferruginea (Pallas)

Anas ferruginea Pallas, in Vroeg's Cat., 1764, Adumbr., p. 5. (No type locality given, = Tartary.)

English: Ruddy Sheldrake.
Japanese: Aka tsukushigamo (red sheldrake.)

Specimen records:

Hamgyong Pukto	— 23 Dec. 1924 (Kur).
Hamgyong Namdo	— 2 Mar. 1919 (Taka).
Hwanghae Do	— 20 Jan, 1912 (Taka).

Kyonggi Do	— Dec. 1887 (Tacz); Feb. May 1909, 5 Mar. 1911 (LiWM); 5 Nov. 1922, 18 Nov. 1929 (SoM); 1 Feb. 1926 (2) (Kur); 10 Dec. 1927 (Taka); 5 Mar. 1931 (Won); 30 Jan. 1935 (USNM); 15 Jan. 1946 (MCZ).
Chungchong Namdo	— 5 Jan. 1913 (SSC); 28 Dec. 1926 (Taka).
Cholla Pukto	— Jan. 1929 (Kur).
Cholla Namdo	— Dec. 1902 (USNM).

The Ruddy Sheldrake is a common winter visitor, most abundant along the east and south coasts. Taczanowski (1888, 468) says "small numbers in winter, spring and autumn, absent in summer; very numerous in spring in the rice fields of south Korea." Y. Kuroda and Miyakoda (1919, 150) give its season in Kyonggi Do as November through April.

I encountered the species constantly near Suwon from 3 January through February and March, usually at the heads of the inlets, or gathered in small flocks in dry rice paddies near salt water, slowly foraging in the stubble. I saw a flock of 60 on 20 March, and the last was a pair 24 March 1946. I shot two on a frozen paddy about five miles from the head of salt water, 15 January.

43. Tadorna tadorna (Linné)

Anas tadorna Linné, Syst. Nat., ed. 10, **1**, 1758, p. 122. (Sweden.)

English: Sheldrake.

Japanese: Tsukushi gamo (duck from Tsukushi, an ancient prefecture in northern Kyushu.)

Specimen records:

Pyongan Pukto	— 17 April 1929 (2) (Yam); 18 Oct. 1931 (SSC).
Hwanghae Do	— March 1911 (Taka).
Kyonggi Do	— 15 Oct. 1911, 28 Nov. 1914, 30 Nov. 1910 (LiWM); 11 Nov. 1917 (2) (Kur); 16 Dec 1927 (Taka).
Chungchong Namdo	— 20 Feb. 1914 (SSC).
Cholla Namdo	— Dec. (Kur); undated (SSC); 20 Dec. 1926 (Taka).

The Sheldrake is an uncommon transient visitor. I failed to find it, and none of the early writers mention it. Kuroda (1917, 12) says "many in early April" in Cholla Namdo, but Won (1934, 105) never collected it and calls it rare. Cumming (1933, 52) says it is usually found in small flocks and that it is "a large showy duck shy enough to be very difficult of approach but rather heavy in flight."

44. Pseudotadorna cristata Kuroda

Pseudotadorna cristata Kuroda, Tori, **1**, 1917, p 1, f. 1. (Naktung River, near Fusan, Korea.)

English: Kuroda's Sheldrake.

Japanese: Kammuri tsukushigamo (crested sheldrake.)

A footnote in the Hand-List of Japanese Birds thus summarizes the status of this rarity: "Formerly believed to be common, 3 specimens (1♂ 2♀ ♀) are known. About 120 years old drawing and description prove occurrence of this duck near Hakodate. *cf.* Kuroda, Tori, **10** (50), pp. 739–741, figs. 135, 136, 1940."

The first known specimen was a female, taken near Vladivostok in April, 1877, by Lt. Fr. Irminger, and at last reports was in the Copenhagen Museum (*cf.* Taka-Tsukasa, 1925, 358). This specimen was described in 1890 by Sclater as a possible hybrid between the Ruddy Sheldrake and the Falcated Teal.

The second specimen, also a female, taken near Fusan, December (3?), 1916, was the type of Kuroda's original description.

Third and last is the only male, which was taken (with a female which was given to a friend of the collector) at the mouth of the Kun-Kiang River in Cholla Pukto by Mr. S. Nakamura of Seoul. The date Mr. Nakamura collected his pair is rather indefinite, but he told Kuroda that he shot them toward the end of November or early in December in either 1913 or 1914. What became of the other bird "given to a friend of the collector" is not known.

The last two specimens were fortunately among the few items to be saved when the entire Kuroda collection was destroyed in May, 1945 by the B-29 fire-raids.

The question as to whether or not this is a valid species, perhaps once common but now approaching extinction (a parallel case is that of the Labrador Duck), or just a rare hybrid, can be settled only by the success or failure of reproducing it by hybridizing all the possible parents experimentally, as Hartert advocated (Bull. Brit. Orn. Cl., **45**, 1924, p. 48).

45. Anas platyrhynchos platyrhynchos Linné

Anas platyrhynchos Linné, Syst. Nat., ed. 10, **1**, 1758, p. 125. (Sweden.)

English: Mallard.

Japanese: Magamo (true duck.)

Specimen records:

Hamgyong Pukto — 8, 12 Oct. 1929 (Yam).
Pyongan Namdo — 20 March 1932 (Won).
Hwanghae Do — Jan. (Kur); 17 Dec. 1926 (4) (Taka).
Kyonggi Do — Nov. 1909 (LiWM); 2 Apr. 1912 (SSC); March 1916, Feb. 1917, Jan. 1922 (Kur); 20 Mar. 1922 (2) (Taka); 30 Mar. 1928 (SoM); 3, 12 Mar. 1946 (MCZ).
Cholla Namdo — 12, 12, 21 Feb. 1927 (Taka).

The Mallard is a common spring and autumn transient throughout Korea. It is not uncommon in winter in the southern portions wherever there is open water. Y. Kuroda and Miyakoda (1919, 149) give its season near Seoul as late February through April, October and November. Taczanowski's note (1888, 460) that it "nests in small numbers" has been disregarded by subsequent authorities as unverified, and perhaps referable to the Spot-billed Duck.

There were Mallards on the lake at Suwon until it froze over in mid-December 1945. I saw eight there 12 December. I encountered scattered individuals in January and February, usually on or near salt water, but the flight began the end of February. Through March the species was abundant, the commonest of all the ducks. They were also the last ducks to remain in numbers at the end of the waterfowl flight. I saw 500 in one raft on 1 April, and my last note for the species is of a flock of fifteen on the lake at Suwon 16 April.

46. Anas poecilorhyncha zonorhyncha Swinhoe

Anas zonorhyncha Swinhoe, Ibis, 1866, p 394. (Ningpo, China.)
English: Spot-billed Duck.
Japanese: Karu gamo (light, not heavy, duck.)

Specimen records:

Hamgyong Pukto — 9 Oct. 1915 (SSC); 10 Oct. 1929 (Yam).
Pyongan Pukto — 6 Apr. 1929 (Yam).
Pyongan Namdo — 4 Nov. 1931 (Won).
Hwanghae Do — March (Kur).
Kangwon Do — 25 June (2 downy yg.), 13 July 1929 (Yam).
Kyonggi Do — 3 May 1887 (Tacz); Oct., Nov. 1909, 3 Apr. 1911 (LiWM); 8, 23, 23 Nov. 1927 (Taka); 11 Oct. 1930 (Won); 29 Sept. 1930 (SoM); 18 June 1933, 15 July 1934 (downy yg.) (Uch); 1 Mar. 1946 (MCZ).
Cholla Pukto — 1 Jan. 1912 (LiWM).
Cholla Namdo — 21 Jan. 1927 (Taka); 27 Dec. 1929 (Yam).

The Spot-billed Duck is the resident duck of Korea. It breeds throughout the northern two-thirds and moves southward in winter, staying in the southern areas as long as there is open fresh water. Taczanowski comments (1888, 458) "small numbers in general, in spring and autumn, mostly one sees it in pairs; in spring this duck appears before the other species." It is never very numerous, and does not congregate in large flocks like the Mallard, Pintail and the various teals. A group of fifty was the largest single unit I observed. The bird reminded me of the Black Duck of eastern North America, its Nearctic homologue. It acts just the way the "spring blacks" do on Cape Cod, pairing off and feeding in doubles away from the other waterfowl in lonely lakes and paddies.

The first arrivals were a pair which dropped into Suwon lake soon after the ice departed, 26 February 1946. After that small knots of them could be found wherever there were waterfowl during the spring flight. They were common in numbers after the main flights of other species had passed. I saw twenty in the pond 12 April and thirty at the shore 20 April. There were two pairs still around Suwon lake when I left in early May.

The species' breeding in Korea is well attested by the downy young Orii collected in Kangwon Do. Yoshida (1923) says that many breed at Ongjin, Hwanghae Do, and tells of collecting a young of the year there 3 July 1922. Kuroda (1934, 4091) writes "it seems probable that this duck breeds at many localities in the Korean peninsula." Hashimoto (1937) found three nests on Hachibi Island, Kyonggi Do 24 May 1933, one of which hatched on 18 June 1933. He watched another pair breeding there the following year, which laid eight eggs between 8 and 21 June. He followed the incubation, noting that the parents covered the eggs when leaving the nest. They hatched successfully 16 July, after an incubation period of 24 days.

47. Anas querquedula Linné

Anas Querquedula Linné, Syst Nat., ed. 10, **1**, 1758, p. 126. (Sweden.)

English: Garganey.

Japanese: Shima aji (striped mackerel.)

Specimen records:

Pyongan Pukto — 17, 20 April 1929 (Yam).
Pyongan Namdo — 15 April 1932 (Won).
Kangwon Do — 17 Sept. 1914 (LiWM).

Kyonggi Do — Mar. 1913 (LiWM); April (Kur); 15 May 1919 (SSC); 25 Sept. 1927 (3) (Taka); Nov. 1934 (SoM).

The Garganey is an uncommon, but evidently a regular transient visitor. Won (1934, 106) considers it rare. I saw the bird only twice. I found one feeding with other dipping ducks in the flooded rice paddies on 17 March during the height of the waterfowl flight, and two more at the head of Suwon Lake 22 March 1946.

48. Anas crecca crecca Linné

Anas Crecca Linné, Syst. Nat., ed. 10, **1**, 1758, p. 126. (Sweden.)
English: Eurasian Teal.
Japanese: Ko gamo (little duck.)

Specimen records:

Hamgyong Pukto — 26 Sept. 1917 (LiWM); 16 Sept. 1929 (Yam, now MCZ).
Hamgyong Namdo — Sept. (Kur).
Pyongan Pukto — 11, 21 Apr. 1929 (Yam).
Pyongan Namdo — 25 March 1932 (Won).
Hwanghae Do — 24 April 1917 (SSC).
Kyonggi Do — March 1889 (Camp); April, Oct. 1909 (LiWM); 25 April (Kur); 9–25 Oct. 1927 (4) (Taka); 8 Apr. 1930 (Won); Apr. 1932 (2) (SoM); 8 Jan., 3 Mar. 1946 (MCZ).
Cholla Namdo — Nov. 1918 (3) (Kur); 12 Feb. 1927 (5) (Taka).
Kyongsang Namdo — 23 Jan. 1886 (USNM); Dec. 1922 (5) (Kur).

This is the commonest of the teals in Korea, numerous during spring and autumn flights, and not uncommon during the winter. A flock of twenty remained in Suwon lake until it froze in mid-December, and stayed in the vicinity afterward in nearby salt water, coming frequently through January to the open ripples below the dam for fresh water. Their numbers increased as the waterfowl flight commenced the end of February, and I estimated 700 in one flock 9 March. The big flocks left by 25 March, but I saw scattered small groups as late as 3 April.

Y. Kuroda (1918) saw a flock of twenty in Kangwon Do 8 September, but gives its usual fall arrival as late September, becoming common by late October. Its spring flight he gives as from late February through April.

49. Anas formosa Georgi

Anas formosa Georgi, Bemerk. Reise Russ. Reich, **1**, 1775, p. 168. (Lake Baikal.)

English: Spectacled Teal.

Japanese: Tomoe gamo (swirl duck, from the facial markings.)

Specimen records:

Hamgyong Pukto	— 11 Nov. 1929 (Yam).
Pyongan Namdo	— 23, 25 Mar. 1932 (Won).
Hwanghae Do	— March (Kur).
Kangwon Do	— 26, 29 Sept. 1914 (LiWM).
Kyonggi Do	— 10 Oct. 1912, 22 Mar. 1936 (SSC); 28 Mar. 1929 (Won); 25 Oct. 1926, 7–18 March (4), 9 Sept., 3 Oct. (4) 1927 (Taka); 12 March 1946 (MCZ).
Cholla Pukto	— 31 Dec. 1911 (LiWM).
Cholla Namdo	— 12 Feb. 1927 (Taka).
Kyongsang Namdo	— 18, 24 Jan. 1886 (USNM); Jan. 1928 (Kur); 31 Dec. 1922 (Taka).

The little Spectacled Teal is a common spring and autumn transient in Korea. Its migration is more pronounced than that of the Eurasian Teal, for it arrives later, departs earlier, and while present occurs in flocks which are sometimes immense. I watched one line go over on 14 March that I hesitated to estimate. It was at least two miles in length and must have contained well over ten thousand birds. Y. Kuroda and Miyakoda (1919, 149) give its Seoul dates as October, and March and April, also adding "most numerous every year around March 16, occasionally flying in lines three miles or more long."

I saw the first of them at Suwon 26 February 1946; the major part of the flight went through from 5 to 20 March, the last of them 23 March.

50. Anas falcata Georgi

Anas falcata Georgi, Bemerk. Reise Russ. Reich, **1**, 1775, p. 167. (Asiatic Russia.)

English: Falcated Teal.

Japanese: Yoshi gamo (marsh-reed duck.)

Specimen records:

Hamgyong Pukto	— 29 Apr. 1912 (2) (AMNH); 24 Sept. 1929 (Yam).

Pyongan Pukto — 22 Apr. 1929 (Yam).
Kyonggi Do — 10 Mar. 1912 (2) (LiWM); 15 March, 9 Oct. 1927, 21 Jan. 1928 (Taka); 14 March 1929, 5 March 1934 (SoM).
Cholla Namdo — Dec. (Kur); 20 Feb. 1913 (SSC).
Kyongsang Namdo — 10 Dec. 1884 (USNM); 20 Jan. 1912 (3) (AMNH); Dec. 1922 (Kur).

The Falcated Teal is not an uncommon migrant in Korea, but not nearly so abundant as the Eurasian and Spectacled Teals. It usually occurs in small flocks, mixed in with the rafts of other waterfowl. I observed five on 9 March, the first I saw. Sundry similar small knots were to be found for the next two weeks wherever ducks were common, and the last was another flock of five that visited Suwon Lake 25 March 1946.

51. Anas acuta acuta Linné

Anas acuta Linné, Syst. Nat., ed. 10, **1**, 1758, p. 128. (Sweden.)
English: Pintail.
Japanese: Onaga gamo (long-tailed duck.)

Specimen records:

Pyongan Namdo — 20, 27, 29 March 1932 (Won).
Kyonggi Do — 10 Feb., Mar., 25 Oct. 1913 (LiWM); 20 May 1919, 9 Oct. 1929 (SSC); 2 March (4), 20 Oct., 15 Nov., 10 Dec. 1927, 7 Nov. 1926 (2) (Taka); Feb. 1933 (SoM); 3 March 1946 (MCZ).
Kyongsang Namdo — 3 March 1915 (LiWM).

The Pintail is a common migrant, second in abundance only to the Mallard among the dipping ducks. The forerunners of the flight appeared near Suwon in late February, and by 5 March the species was abundant in the flooded paddies at the head of the inlet. Their numbers did not begin to dwindle until 20 March. I saw the last of them 25 March.

My observations do not coincide with those of Y. Kuroda and Miyakoda (1919, 149) who give the dates of October and early November, and late March and April. They say "the migration of this bird follows the Red-breasted Merganser", which was not borne out by my experiences. I found Pintails and Mallards the backbone (so to speak) of the migration the second and third weeks of March, while the Mergansers remained considerably later.

52. Mareca penelope (Linné)

Anas Penelope Linné, Syst. Nat., ed. 10, **1**, 1758, p. 126. (Sweden.)
English: Widgeon.
Japanese: Hidori gamo (redbird ? duck.)

Specimen records:

Pyongan Pukto — 22 Apr. 1929 (Yam).
Pyongan Namdo — 21 Mar. 1933 (Won).
Kangwon Do — April (Kur); 3 Mar. 1916 (SSC).
Kyonggi Do — 22 Oct. 1913 (LiWM); 17 Nov. 1926 (Taka); 2 Oct. 1929 (SoM); 12 Mar. 1946 (MCZ).

I found the Wigeon a far more abundant migrant than the literature or the specimen records indicate. The vanguard appeared the first of March, and the main flight went through from the 5th to the 15th at the shore with the other waterfowl. I shot five there between the 10th and the 15th of March, and counted 250 in one flock on the 12th. The rear echelons lingered considerably later. There were forty on the lake at Suwon the 21st, twenty on the 22nd and six on the 25th of March. I saw four stragglers there 12 April, and a late flight of thirty at the shore 20 April 1946.

[*Mareca americana* (Gmelin)
English: Baldpate.
Japanese: Amerika hidori (American widgeon.)

The 1942 Hand-List erroneously gives this species as occurring in Korea on the basis of Cumming (1933, 83), who in turn made the original error of copying it as a Korean bird from the 1932 Hand-List, where it is shown only as a straggler to Honshu.]

53. Chaulelasmus streperus (Linné)

Anas strepera Linné, Syst. Nat., ed. 10, **1**, 1758, p. 125. (Sweden.)
English: Gadwall.
Japanese: Oka yoshigamo (upland teal.)

Specimen records:

Pyongan Namdo — 21 March 1933 (Won).
Kyonggi Do — Dec. 1916 (LiWM); undated (SSC).

The Gadwall is a rare transient. Korea is not a portion of its regular migration route, but in view of the species' general distribution it should occur more frequently than the record indicates. I failed to find it among the hordes of waterfowl I observed. Won (1934, 105) calls it common, but inasmuch as he calls the Wigeon rare, which I found common, his field identification in this case may be questioned.

54. Spatula clypeata (Linné)

Anas clypeata Linné, Syst. Nat., ed. 10, **1**, 1758, p. 124. (Sweden.)
English: Shoveler.
Japanese: Hashi-biro gamo (broad-billed duck.)

Specimen records:

Hamgyong Pukto — 26 Sept. 1917 (LiWM); 12, 23 Oct. 1929 (Yam).
Pyongan Pukto — 3 May 1917 (Kur); 23 Apr. 1929 (Yam).
Pyongan Namdo — 30 Apr. 1932 (Won).
Kyonggi Do — Oct., Nov. 1909, Mar., 2 Nov. 1913 (LiWM); April 1917 (Kur); 20 Feb. 1919 (SSC); 25 Apr. 1926 (Taka); 28 Mar. 1929, 20 Mar. 1934 (SoM).

The Shoveller is a not uncommon migrant in Korea, lingering slightly later in spring than the main waterfowl flight. Y. Kuroda and Miyakoda (1919,149) give its dates as late March and April, late October and November. The first I found were three on 10 March, and three more on 12 March. I saw a flock of twenty-three on 17 March, and then none until 26 April when three dropped into Suwon Lake. It frequents the shallow paddies more than the other species do, and is found in areas usually preferred by the waders.

55. Aix galericulata (Linné)

Anas galericulata Linné, Syst. Nat., ed. 10, **1**, 1758, p. 128. (China.)
English: Mandarin Duck.
Japanese: Hoshidori (autochthonous.)

Specimen records:

Hamgyong Pukto — 16 Apr., 23 May 1912 (13) (AMNH).
Hamgyong Namdo — 17 Sept. 1912 (SSC); 26 Mar. 1914 (LiWM); 20 Jan. 1927 (Taka).
Pyongan Pukto — 5–14 Apr. 1929 (4) (Yam).
Kangwon Do — Sept. 1887 (Camp); Dec. 1915 (Kur).

Kyonggi Do — July, Nov. 1909, 24 Mar., June 1910, 2 Mar. 1911 (LiWM); 23 Apr. 1917 (Kur); 11 Oct. (5), 20 Nov., 20 Dec. 1927 (Taka); 4 Feb., 14 Aug., 24 Sept 1929 (Won); Aug. 1930 (SoM); 7 Apr. 1930 (USNM).
Kyongsang Namdo — 9 Jan. 1917 (Kur).

The Mandarin Duck is a not uncommon transient in Korea. Y. Kuroda and Miyakoda (1919,149) say it passes Seoul in April, late October and November. Won (1934, 106) on the other hand, claims it migrates earlier than the other ducks in the autumn. His statement that it nests in Pyongan Namdo has not been credited by subsequent authors, for there is no breeding evidence.

This species is a bird of the woodlands, fond of fresh water and tree cover, similar in habits and habitat to the congeneric American Wood Duck. It is seldom found in the open waters of the inlets or large rice paddies with the other migrating waterfowl, but prefers woodland lakes and streams. Campbell (1892, 245) says of the specimen he took in the Diamond Mountains in September 1889, that his "attention was drawn to it by its curious behavior for a duck . . . it was on the top of a haystack." I saw it only at the King's Forest south of Suwon, where I flushed five from a sheltered pond on 6 April. I saw another pair at the same place 20 April, but was unable to collect them. They were all very shy and wild.

56. Aythya ferina (Linné)

Anas ferina Linné, Syst. Nat., ed. 10, 1, 1758, p. 126. (Sweden.)
English: Pochard.
Japanese: Hoshi hajiro (star, white-feather.)

Specimen records:

Hamgyong Namdo — 5 Jan. 1914 (SSC).
Hwanghae Do — Jan. (Kur).
Kangwon Do — 25 Oct. 1926 (Taka).
Kyonggi Do — Sept. 1909 (LiWM); 20 Apr. 1926 (Taka); 5 Nov. 1927 (Won).

The Pochard is a rare visitor to Korea, perhaps of more regular occurrence however, than the scant records indicate. Won (1934, 106) calls it rare, and Y. Kuroda and Miyakoda's (1919, 149) listing of the species in Seoul for March and April, October and November, is rather doubtful. I saw the bird but once, a lone male near Suwon on 9 March 1946, in company with a flock of scaup.

57. Aythya fuligula (Linné)

Anas fuligula Linné, Syst. Nat., ed. 10, **1**, 1758, p. 128. (Sweden.)
English: Tufted Duck.
Japanese: Kinkuro hajiro (golden-black scaup.)

Specimen records:

Hamgyong Pukto — 14 Oct., 12 Nov. 1929 (Yam).
Hamgyong Namdo — Nov. (Kur); 22 Nov. 1914 (SSC).
Hwanghae Do — 20 Mar. 1914, 3 Apr. 1916 (LiWM); 11 Nov. 1930, 10 Apr. 1932 (Won).
Kangwon Do — 4 Apr. 1914 (2) (LiWM).
Kyonggi Do — Nov. 1909, 21 Oct. 1912 (LiWM); 5 Oct. 1922 (3), 18 Nov. 1929 (2) (SoM); 7 Nov. 1926, 23 Mar. 1927 (4) (Taka); 6 Feb., 29 Dec. 1928 (Won); 20 Mar. 1932 (USNM).

The Tufted Duck is a common winter visitor in Korea. It occupies the ecological niche taken by the Lesser Scaup in North America, and prefers the more sheltered inland coastal waters to the outer bays where the Greater Scaup is more common. Campbell (1892, 245) comments it is "rarely absent from the Han or Seoul River during the winter." Y. Kuroda and Miyakoda (1919, 149) give its season as October and November, and March and April, but I observed it commonly during January and February in the same general area. It showed a marked increase in numbers during the March waterfowl flight, and pairs lingered in the shallow inland ponds well into April, my latest date being 15 April 1946.

58. Aythya baeri (Radde)

Anas (*Fuligula*) *Baeri* Radde, Reisen Sud von Ost-Siberien, **2**, 1863, p. 376, pl. 15. (Southeast Siberia.)
English: Baer's Pochard, Siberian White-eyed Duck.
Japanese: Aka hajiro (red scaup.)

This comparatively little-known species has occurred twice in Korea. The LiWong Museum has an immature bird collected on the Han River near Seoul 18 October 1912. The other specimen was taken 29 December 1916 in Hwanghae Do, and is now in the Seoul Natural History Museum.

59. Aythya marila mariloides (Vigors)

Fuligula Mariloides Vigors, Zool. Beechey's Voy. 'Blossom,' 1839, p. 31. (No type locality — Behring Sea.)

English: Greater Scaup Duck.
Japanese: Suzu gamo (bell duck.)

Specimen records:

Hamgyong Pukto — 12 Nov. 1929 (Yam).
Hamgyong Namdo — Nov., 26 Apr. 1917 (5) (Kur).
Kyonggi Do — Nov. 1909 (LiWM); 24 May 1919 (SSC); 9 Dec. 1934 (USNM).
Cholla Namdo — 11, 13 Apr. 1917 (4) (Kur).
Kyongsang Namdo — 20, 25 Dec. 1914 (LiWM).

This species is a common winter visitor along the coasts from Kyonggi Do southward. Kuroda (1917, 5) "met flocks of 20-40 at Moppo [Cholla Namdo, 11 April] and at Wonsan [Hamgyong Namdo, 26 April], and comments (1918, 501) "very common in harbours and on rivers." Won (1934, 106) never collected it, strangely enough, and calls it rare.

I observed small flocks in Inchon Harbor whenever I went there, which was at almost fortnightly intervals from November to March, and found them at the heads of the inlets near Suwon throughout March and into April. I never saw them in the big rafts so frequently seen off New England, but usually in smaller flocks of from ten to one hundred birds.

60. Bucephala clangula clangula (Linné)

Anas Clangula Linné, Syst. Nat., ed. 10, 1, 1758, p. 125. (Sweden.)

English: Golden-eye.
Japanese: Hojiro gamo (white-cheeked duck.)

Specimen records:

Hamgyong Namdo — 2 Dec. 1887 (Tacz); 3 Nov. 1914 (SSC); 26 Apr. 1917 (Kur).
Kyonggi Do — Feb. (2), Mar. 1909, 20 Oct., 20 Dec. 1912, 31 Oct. 1914 (LiWM); Apr. 1932 (2) (SoM).
Kyongsang Namdo — 8 Dec. 1883 (USNM); 28 Feb. 1918 (Taka).

The Golden-eye is a common winter visitor, frequenting the harbors and inlets along the coast. Taczanowski (1888, 468) says "quite com-

mon in spring and winter on the sea, but scarcer on the rivers." Won (1934, 107) calls it rare, but perhaps did not know the bird. Kuroda 1917, 9, suppl.) saw a flock of twenty in Wonsan harbor, Hamgyong Namdo, "none in sexual plumage", 26 April 1917.

I observed it frequently in Inchon Harbor during December and January. There were six in the lake at Suwon during December before it froze over, and two dropped into holes in the ice that opened temporarily during a January thaw. There were a score or more in Inchon harbor 20 February. A pair in the lake at Suwon 20 March 1946 were the last I saw.

61. Clangula hyemalis (Linné)

Anas hyemalis Linné, Syst. Nat., ed. 10, **1**, 1758, p. 126. (Sweden.)

English: Long-tailed Duck, Old Squaw.

Japanese: Kori gamo (ice duck.)

Specimen records:

Hamgyong Pukto — 2 Jan. 1917 (2) (Mom).
Hamgyong Namdo — undated (SSC); 26 Apr. 1917 (2) (Kur); 15 Nov. 1926 (2) (Taka).
Pyongan Namdo — 26 June 1931 (Won).
Kangwon Do — 7, 8 Apr. 1914 (3) (LiWM).
Kyonggi Do — 23 Nov. 1914 (LiWM); late Mar. 1917 (Kur).

This species is a fairly common winter visitor along the east coast, but rare along the south and west shores. Kuroda (1917, suppl.) collected two at Wonsan 26 April 1917 and adds "another flock of about 20 was seen at Wonsan, almost all of them (except one) in summer plumage. I think there may be a few in southern Korea. The bird seems rare in central Korea." He states elsewhere (1918, 500) "in the harbour of Genzan [Wonsan] it is very abundant." Won (1934, 107), however, knowing only the west coast, calls it rare.

62. Histrionicus histrionicus pacificus Brooks

Histrionicus histrionicus pacificus Brooks, Bull. Mus. Comp. Zoöl., **59**, 1915, p. 393. (Cape Shipunski, Kamchatka.)

English: Pacific Harlequin Duck.

Japanese: Shinori gamo (early morning duck.)

Specimen records:

Hamgyong Pukto — 24 Oct. 1929 (Yam).
Hamgyong Namdo — Nov. (Kur); 3 Dec. 1914 (SSC); 2 Jan. 1927 (Taka).
Kangwon Do — 20 Jan. 1913, 1 Apr. 1914 (LiWM).
Kyonggi Do — 27 Nov. 1910 (LiWM).
Kyongsang Namdo — 14 Mar., 14 Dec. 1886 (USNM); 26 Dec. 1914 (LiWM).

The Harlequin is not an uncommon winter visitor along the east coast, and comes as far south as Fusan. But it seldom visits the Korean shores of the Yellow Sea.

63. Melanitta nigra americana (Swainson)

Oidemia americana Swainson, in Swainson and Richardson, Fauna Bor. Am., 2, 1831 (1832), p. 450. (Hudson Bay.)

English: American Black Scoter.
Japanese: Kuro gamo (black duck.)

Specimen records:

Hamgyong Pukto — 24 Oct. 1929 (Yam).
Hamgyong Namdo — Dec. 1887 (Tacz); 16 Nov. 1914 (SSC).
Kangwon Do — Dec. (Kur).
Hwanghae Do — 22 Feb. 1916 (5) (LiWM).
Kyonggi Do — Oct. 1920 (SoM); 25 Feb. 1930 (Taka).

While the Black Scoter is not an uncommon winter visitor along the northeast coast, it is comparatively rare on the western side of Korea. Taczanowski (1888, 461) says "only found in winter on the sea near Wonsan". Won (1934, 107) considers it rare. Y. Kuroda and Miyakoda (1919, 149) say it occurs near Seoul in March and April, October and November, which is difficult to believe in the absence of specimens or other corroborative evidence to back their claims.

64. Melanitta fusca stejnegeri (Ridgway)

Oidemia stejnegeri Ridgway, Man. N. Am. Birds, 1887, p. 112. (Kamchatka to Japan.)

English: Easter Velvet Scoter.
Japanese: Birodo kinkuro (velvet golden-black.)

Specimen records:

Hamgyong Pukto — 24 Oct. 1929 (Yam).
Hamgyong Namdo — 26 Apr. 1917 (3) (Kur).
Hwanghae Do — 22 Feb. 1916 (2) (LiWM).
Kangwon Do — 8, 23 Dec. 1914 (LiWM); 1 Dec. 1914 (SSC); Dec. (Kur).
Kyonggi Do — 23 Dec. 1911 (LiWM); 10 Dec. 1927 (Taka); 20 Feb. 1932 (SoM).

As with the other sea ducks, this scoter is a winter visitor, more common on the east coast than on the west. Kuroda (1918, 500) says it occurs "in abundance" on the Bay of Wonsan, Hamgyong Namdo, but Won (1934, 107) found it rare on the coasts of Pyongan Namdo and Hwanghae Do.

65. Mergellus albellus (Linné)

Mergus albellus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 129. (Smyrna)

English: Smew.
Japanese: Miko aisa (son-of-god merganser.)

Specimen records:

Pyongan Pukto — 9–15 Apr. 1929 (5) (Yam).
Pyongan Namdo — 25 Mar. 1932, 25 Mar. 1933 (Won).
Hwanghae Do — Mar. (Kur).
Kyonggi Do — Nov. 1909, 24 Mar., Apr. 1910, 17 Dec. 1911, 2, 9 Mar. 1913 (LiWM); Dec. 1913 (Kur); 20 Mar. 1913 (SSC); 7 Mar.-12 Apr. 1927 (5) (Taka); Mar. 1933, 25 Mar. 1934 (SoM).

This distinctive little white merganser is a common transient, and a few winter in the southern parts of Korea. Taczanowski (1888, 460) says that it winters. Won (1934, 107) calls it common.

I found it more a bird of the fresh waters than maritime. There were two in the pond at Suwon 12 December 1945, and I did not encounter the species again until 11 March 1946, when three appeared out in the center of the lake. Small numbers appeared there during the next few weeks, climaxed by a flock of twenty on 21 March. I saw the last of them 25 March.

66. Mergus merganser orientalis Gould

Mergus Orientalis Gould, Proc. Zool. Soc. London, 1845, p. 1. (Amoy, China.)

English: Goosander.
Japanese: Kawa aisa (river merganser.)

(The Hand-List of Japanese Birds (1942, 131) includes the European form, *M.m.merganser*, on the basis of a single specimen, collected by Orii in Hamgyong Pukto, so identified by Yamashina (1932, 247) because of its slightly larger measurements. I consider this identification questionable.)

Specimen records:

Hamgyong Pukto — Nov. (Kur); 19 Jan. 1915 (SSC); 28 Nov. 1929 (Yam); 15 Oct., 20 Nov. 1926 (Taka).
Pyongan Pukto — 5 Jan. 1931 (Won).
Hwanghae Do — Dec. 1924, 21 Mar. 1925, 1 Dec. 1930 (SoM); 15 Nov. 1926 (Taka); 25 Mar. 1933 (Won).
Kyonggi Do — 24 Mar. (2), Nov. (2) 1909, Dec. 1910, Feb. 1913 (LiWM); 18, 23, 24 Jan. 1928 (Taka).
Cholla Namdo — 29 Jan. 1927 (2) (Taka); 18 Dec. 1929 (Yam).
Kyongsang Namdo — late Dec. 1922 (Kur).

The Goosander is a common spring and autumn transient throughout Korea and a winter visitor in the southern parts. It is not as common as the Red-breasted Merganser. I encountered it only during the waterfowl flight in March, and then not abundantly. I saw two on 14 March, and a flock of eight on 25 March.

67. Mergus squamatus Gould

Mergus squamatus Gould, Proc. Zool. Soc. London, 1854, p. 184. (China.)
English: Chinese Merganser.
Japanese: Korai aisa (merganser of old Korea.)

This rare and little-known species has occurred a number of times in Korea. The Taka-Tsukasa collection contained one taken at Seoul, Kyonggi Do, 20 November 1927. A juvenal male in the LiWong Museum was 'procured' in the Seoul market, and identified by Delacour and Hackisuka (Tori, 1928, 503). Two young males in the American Museum of Natural History were collected by Andrews in Hamgyong Pukto 16 April 1912.

68. Mergus serrator Linné

Mergus serrator Linné, Syst. Nat., ed. 10, 1, 1758, p. 129. (Sweden.)
English: Red-breasted Merganser.
Japanese: Umi aisa (sea merganser.)

Specimen records:

Hamgyong Namdo — 26 Apr. 1917 (Kur).
Kangwon Do — Apr. 1914 (2) (LiWM); Mar. (Kur); 17 Apr. 1916 (SSC).
Kyonggi Do — Nov. 1909, Nov. 1914 (LiWM).
Kyongsang Namdo — Dec. 1922 (Taka).

This is the commonest of the mergansers in Korea. It winters along the coasts and in the coastal bays and rivers, and, while never abundant, appears in migration in considerably greater numbers than the Goosander or the Smew.

Y. Kuroda and Miyakoda (1919, 149) give its Seoul periods as February and March, October and November, adding "this bird is the earliest arrival among spring water birds, sometimes in flocks of several hundred birds." Kuroda (1918, 499) saw it "in abundance on the Naktung River [Kyongsang Namdo] April 6" but found "not many" on 26 April in Hamgyong Namdo. Y. Kuroda (1918, 20) gives its arrival as early March, and observed it in Hamgyong Pukto between 13 and 23 December. Won (1934, 107), surprisingly, never collected it, and calls it rare.

I found it wintering commonly in the larger open waters. There were three in the Han River 1 December, and two in Suwon Lake 12 December. The first perceptible increase in numbers during the spring flight was 15 March. Flocks of from fifteen to thirty birds visited Suwon Lake between March 18th and 25th, and my last record is for a pair seen there 5 April 1946.

ACCIPITRIDAE

69. Pernis apivorus orientalis Taczanowski

Pernis apivorus orientalis Taczanowski, Fauna Orn. Sib.-Orient., pt. 1, 1891, p. 50 (In Mém. Acad. Imp. Sci. St. Pétersb. (7), **39**,) (Eastern Siberia.)
Pernis apivorus neglectus Kuroda, Bds. Java, **2**, 1936, p. 533. (Formosa.)

English: Honey Buzzard.
Japanese: Hachi kuma (honey bear.)

The Hand-List of Japanese Birds (1942, 112) assigns the known Korean specimens to *neglectus*, which was described from specimens taken on the wintering grounds. I have no material available to determine the validity of the race, which cannot be done until breeding specimens are collected and the nesting ground delineated.

Specimen records:

Kyonggi Do — 17 Oct. 1915 (LiWM); 5 Nov. 1922 (Kur); 20 Feb. 1930 (Taka).

The Honey Buzzard is a rare transient visitor. The three specimens above are the only ones known from Korea. Kalinowski (Taczanowski, 1888, 459) claims he observed it "during August and in autumn near Seoul." Mori wrote to Yamashina (1941, 812) that it had not yet been found breeding in Korea, but he thought it might. As the species breeds across southern Siberia to Honshu and Hokkaido, and winters southward to Formosa, southern China and India, it should occur more frequently in Korea, at least on migration (if not during a possible breeding season in the northern mountains) than the records indicate.

70. Milvus migrans lineatus (J. E. Gray)

Haliaetus lineatus J. E. Gray, in Hardwicke, Illustr. Indian Zool., **1**, pt. 8, 1831, p. 1, pl. 18. (China.)

English: Black-eared Kite.
Japanese: Tobi (autochthonous.)

Specimen records:

Hamgyong Pukto — 18 Sept. 1917 (LiWM).
Pyongan Namdo — Oct. 1908 (LiWM).
Kyonggi Do — 19 June 1883 (USNM); Nov., Dec. 1887 (Tacz); March 1909 (LiWM); 7 Oct. 1914 (SSC); 20 Oct. 1930 (Won).
Cholla Namdo — 12 Jan., 19 Feb. 1930 (Yam); 25 Nov 1926, 20 Jan. 1927 (Taka).
Kyongsang Namdo — 13, 30 Apr. 1884 (5) (USNM).

The Black-eared Kite is a common spring and autumn transient in coastal Korea, and a not uncommon winter resident in the southern part. It is seldom observed far from salt water, and is most frequently seen scavenging over the tidal flats in the harbors. Taczanowski (1888, 461) says it is "very common at all seasons of the year." Both Campbell and Cumming mention it as common in Seoul. Yoshida (1923, 315) claims to have seen it in Hwanghae Do in mid-July, and Y. Kuroda (1935, 87) gives another sight record for Chunchong Pukto 25 May 1931. Won (1934, 101) says he collected it in "many localities", that it is common and breeds, and Kobayashi and Ishizawa (1934, 105) include Korea in its breeding range. However, there is no evidence that the species breeds in Korea, nor does the 1942 Japanese Hand-List consider that it does so.

I observed it commonly at Inchon harbor in late November 1945, and saw a single bird flying over the marshes near Seoul 1 December. I next observed it near Suwon 25 April 1946.

71. Accipiter gentilis schvedowi (Menzbier)

Astur palumbarius Schvedowi Menzbier, Orn. Geogr., Eur. Russl. (in Mém. Sci. Univ. Imp. Moscou, Hist. Nat.), 1882, p. 439. (Transbaicalia.)

English: Goshawk.
Japanese: O-taka (big hawk.)

The Hand-List of Japanese Birds (1942, 109) assigns to *A.g.albidus* a single specimen from Kangwon Do, 19 Dec. 1919, in the Kuroda collection. It is unfortunate that the specimen can no longer be examined, for this well-marked, albinistic form, known hitherto only from Kamchatka, is still of controversial status. All the other Korean specimens I have seen are typical *schvedowi.*

Specimen records:

Hamgyong Namdo — Aug. (Kur).
Pyongan Namdo — Nov. 1931, 29 Jan. 1936 (Won).
Kangwon Do — 24 Oct. 1911 (LiWM); 19 Dec. 1919 (Kur).
Kyonggi Do — 25 Dec. 1911, 28 Nov. 1914 (LiWM); 1918 (SSC); 25 Sept. 1926, 3 Dec. 1927, 21 Jan. 1928 (Taka); 20 Jan. 1946 (MCZ).

The Goshawk is an uncommon winter visitor in Korea. I have been unable to verify Kuroda's August record (1917, 73) which was taken from unspecified sources other than his own collection. If valid, it must have been a straggler, possibly a wounded or a sexually undeveloped bird, unable to make the northward trek in springtime.

72. Accipiter soloensis (Horsfield)

Falco Soloensis Horsfield, Trans. Linn. Soc. London, **13**, 1821, p. 137. (Java.)

English: Chinese Goshawk.
Japanese: Akahara daka (red-bellied hawk.)

Specimen records:

Kyonggi Do — 24, 26 Aug. 1883 (USNM); May, June 1887 (3) (Tacz); May, June, 12 June (2) 1909, June 1910 (2) (LiWM);

20 Aug. 1911, June 1913 (Kur); 24 May 1912 (SSC); May 1926, 25 June 1927 (SoM); 11 July 1927 (Taka); 1 July 1929 (Won); May 1933 (Brandt).

Kyongsang Namdo — 5, 14 Aug. 1927 (Taka).

The Chinese Goshawk is an uncommon summer resident in central Korea. Taczanowski (1888, 461) found it "quite rare, nests and leaves the country for the winter. It feeds principally on large beetles and especially on longicorns which it takes either on the wing or off the branches." Won (1934, 100) asserts he collected it in Pyongan Namdo as well as in Kyonggi Do, but lists no data for such a specimen in the holograph list he sent Yamashina. He also says it is rare, and "breeds deep in the mountains". Col. L. R. Wolfe, U.S.A. writes me "I have a set of five eggs received from Snyder with the complete nest and skin of the parent bird, collected near Seoul in May 1933. I traded the skin to Mr. Herbert Brandt of Cleveland. It is probably still in his collection."

73. Accipiter nisus nisosimilis (Tickell)

Falco Nisosimilis Tickell, Journ. As. Soc. Bengal, **2**, 1883, p. 571. (Marcha, Borabhum, India.)

English: Asiatic Sparrow Hawk.
Japanese: Hai taka (ashy hawk.)

Specimen records:

Hamgyong Pukto — 24 Aug., 10 Oct. 1929 (Yam).
Hamgyong Namdo — 25 Dec. 1914 (LiWM); 2 Jan. 1927 (Taka).
Pyongan Pukto — 10 Apr. 1929 (Yam).
Pyongan Namdo — 16 Jan., 28 May 1932, 31 Oct. 1933 (Won).
Kangwon Do — 21 Mar. 1914 (LiWM).
Kyonggi Do — 17, 20 Nov. 1883, 24 Dec. 1934 (USNM); Dec., Jan., Feb., Mar. 1887 (Tacz); Feb., Mar., 13 May, Dec. 1909, 25 Apr. 1913 (LiWM); 1 May 1912 (Kur); 2 Dec. 1918, 21 Jan. 1919, 20 Sept., 23, Nov. 1926, 15 Oct. 1927, 15 Jan. 1930 (Taka); Mar. 1929 (SSC); 10 May 1929 (SoM); 19, 29 Nov. 1928, 10 Feb. 1929, 30 Jan. 1931 (Won); 24 Dec. 1934, 27 Jan., 26 Mar., 2 Apr. 1946 (MCZ).
Chungchong Namdo — 31 Jan. 1915 (SSC).
Cholla Namdo — 8 Jan. 1927 (Taka); 26 Oct. 1928 (Uch); 11 Dec. 1929, 20 Feb. 1930 (Yam).
Kyongsang Namdo — 14 Dec. 1883, 30 Nov. 1884 (USNM); 9 Feb. 1912 (AMNH).

This species is a common transient and winter resident, and perhaps a summer resident in the north. When its movements are better known it will probably be found to breed in the central and northern highlands, and to move southward and to the plains lands in winter. The Japanese consider it a resident species, and both Yamashina (1941, 854) and the Japanese Hand-List (1942, 110) say it breeds in Korea. Won (1934, 101) says it is common and that it "breeds deep in the mountains", which in itself is suspicious, and Taczanowski (1888, 462) says "resident and quite common at all seasons." But there is no evidence, other than the collecting dates, of the species' breeding in Korea.

74. Accipiter virgatus gularis (Temminck and Schlegel)

Astur (*Nisus*) *gularis* Temminck and Schlegel, in Siebold, Fauna Jap., Aves, 1844, p. 5, pl. 2. (Japan.)

English: Japanese Sparrow Hawk.
Japanese: Tsumi (autochthonous.)

Specimen records:

Hamgyong Pukto	— 6 Sept. 1929 (Yam).
Hamgyong Namdo	— 20 Sept. 1912 (SSC).
Pyongan Pukto	— 29 Sept. 1915 (SSC); 14 May 1929 (Yam).
Pyongan Namdo	— 9 Jan. 1931 (Won).
Kyonggi Do	— 13 Oct. 1917 (LiWM); Feb., 30 Aug. (Kur); 23 Nov. 1926 (Taka); July 1927 (SoM).
Cholla Namdo	— 5 Oct. 1926, 10 May 1931 (2) (Ueh); 29 Jan. 1927 (Taka).

This species is a not uncommon summer resident, and occurs rarely in winter. Won (1934, 101) considers it rare. Cumming (1931, 48) notes "these birds are used in falconry to catch small birds" but his identification may well refer to the preceding species. Yoshida (1932, 343) lists none of the small hawks as being used in Korean falconry.

There is a nest and set of eggs in the LiWong Museum labelled "tsumi taka, Kyonggi Do, 23 May 1910". Col. L. R. Wolfe, U.S.A. writes me of this species, "Snyder sent me four sets of eggs, all collected near Seoul in May, 1933. Open nests in small pines."

75. Buteo rufinus hemilasius Temminck and Schlegel

Buteo hemilasius Temminck and Schlegel, in Siebold, Fauna Jap., Aves, 1844, p. 18, pl. 7. (Japan.)

English: Upland Buzzard.
Japanese: O-nosuri (large buzzard.)

Specimen records:

Pyongan Namdo — 28 Dec. 1926 (Taka).
Kyonggi Do — Jan. 1888 (Tacz); Dec. 1888 (Camp.); 1912 (SSC); undated (SoM); 24 Mar. 1910, 15 Dec., Feb. 1911, 4 Nov. 1914 (LiWM); Jan. 1917 (Kur); 18 Oct. 1918, 25 Oct. 1926, 8 Jan., 14 Dec. 1927 (Taka); 12 Dec. 1934 (MCZ).
Cholla Namdo — 17 Jan.-17 Feb. 1930 (3) (Yam).
Kyongsang Namdo — 7 Jan., 18 Feb., 3 Mar. 1884 (USNM); 24 Dec. 1914 (LiWM).

The Upland Buzzard is, from the specimen record, a not uncommon winter visitor in Korea from Kyonggi Do southward. I never was able to identify it positively among the hawks I saw afield, and I found the Japanese Buzzard the common wintering Buteo in the Suwon-Seoul area. However, Won (1934, 100) considers it common, and even states it "breeds, deep in the mountains." Yamashina (1941, 776) says with more logic "it migrates to Korea in winter; not rare from October to March, but does not breed there."

76. Buteo buteo burmanicus Hume

Buteo burmanicus Hume, Stray Feath., **3**, 1875, p. 30, in text. (Upper Burma.)

English: Japanese Buzzard.
Japanese: Nosuri (autochthonous.)

Specimen records:

Pyongan Namdo — 26 Dec. 1926 (Mom); 27 Oct. 1932, 24 Nov. 1935, 10 Jan. 1939 (Won).
Kangwon Do — 26–28 Nov. 1929 (3) (Yam).
Kyonggi Do — Mar. 1887, 15 Jan. 1888 (Tacz); Dec. 1888 (Camp); undated (SoM); Sept. 1910, 15 Jan., 3 Dec. 1911, 27 Jan. 1912, 25 Oct. 1914 (LiWM); 23 Jan. 1917, 5 Oct. 1922 (3), 26 Dec. 1926 (Mom); Feb. 1917, 20 Jan. 1926 (Kur); 18, 18, 24 Nov., 23, 26 Dec. 1926 (Taka); 9 Jan. 1930 (SSC); 23 Mar. 1930 (Won); 10, 17, 30 Jan. 1946 (MCZ).
Chungchong Namdo — 15 Jan. 1915 (SSC).
Cholla Namdo — 29 Jan.- 19 Feb. 1929 (3) (Yam).
Kyongsang Namdo — 18 Feb. 1884 (USNM); 14 Feb. 1912 (AMNH); 23 Dec. 1914 (LiWM).

The Japanese Buzzard is a common winter resident. Taczanowski (1888, 461) found it "only in winter." Won (1934, 100) calls it common

and breeding. Yamashina (1941, 700) says "migratory on the continent . . . Breeding range extends to Korea." The 1942 Hand-List makes no mention of its breeding in Korea, and indeed, there is no evidence that it does so.

I found it the common winter Buteo in the Suwon-Seoul area, where it hunts line-backed mice (*Apodymys*) over the rice-paddies, and is fond of sitting on telegraph poles, which make fine vantage points. I collected three adult females from such perches with a carbine during January, and I kept seeing them through February, after which they became scarcer, and finally disappeared by mid-March.

77. Buteo lagopus kamtschatkensis Démentiev

Archibuteo pallidus Menzbier, Orn. Turkestan, **1**, 1888, p. 163. (Siberia, Turkestan, Kamchatka, Ussuri.) Not *Buteo pallidus* Lesson, 1831.

Buteo lagopus kamtschatkensis Démentiev, Orn. Monatsb., **39**, 1931, p. 54. (Mouth of the Kichtchik River, Kamchatka.)

English: Siberian Rough-legged Buzzard.

Japanese: Ke-ashi nosuri (wooly-legged buzzard.)

Specimen records:

Pyongan Namdo	— 21 Oct. 1938 (Won).
Hwanghae Do	— 12 Nov. 1918 (Taka).
Kyonggi Do	— 1912 (SSC); 12 Jan. 1918 (Kur); 3 Jan. 1926, 8 Dec. 1927 (Taka); 20 Feb. 1929 (Won).
Cholla Namdo	— Dec. 1915 (SSC).
Kyongsang Namdo	— 6 Feb. 1918 (Kur).

The Rough-legged Buzzard is an uncommon winter visitor to Korea.

78. Butastur indicus (Gmelin)

Falco indicus Gmelin, Syst. Nat., **1**, pt. 1, 1788, p. 264. (Java.)

English: Grey-faced Buzzard-eagle.

Japanese: Sashiba (autochthonous.)

Specimen records:

Hwanghae Do	— 12 Sept. 1908 (Taka).
Kyonggi Do	— June, July 1909, Feb. 10 (LiWM); Dec. 1914 (SSC); 2 Sept. 1932 (Won); 6, 6, 13, 18 Apr. 1946 (MCZ).
Kyongsang Namdo	— 14 Feb. 1912 (AMNH).

This bird is a not uncommon spring and autumn transient and an occasional winter resident. I found it fairly common while in passage between 5 and 20 April 1946. Yamashina (1914, 818) says it is "not known to breed in Korea, but I think they probably do", a conclusion not shared by anyone else on record, though it breeds in nearby Ussuriland.

79. Spizaetus nipalensis orientalis Temminck and Schlegel

Spizaëtos orientalis Temminck and Schlegel, in Siebold, Fauna Jap., Aves, 1844, p. 7, 1845, pl. 3. (Japan.)

English: Japanese Hawk-eagle.
Japanese: Kuma taka (bear hawk.)

The 1942 Japanese Hand-List uses *japonensis* (*Falco japonensis* Gmelin, Syst. Nat., **1**, pt. 1, 1788, p. 257) as the specific name of this hawk-eagle, but there is no doubt that Gmelin's name is misemployed. *Falco japonensis* is based solely on the Japanese Eagle of Latham (Syn., **1**, pt. 1, p. 33, no. 7b). Referring to Latham for some of the details not given by Gmelin we find that the bird flew on board a ship off the coast of Japan, and the description of the markings and color on the inner webs of the primaries, coupled with the size of the bird (17 inches) can leave no doubt that the name actually refers to some form of *Falco peregrinus*, probably an immature female.

Specimen records:

Kangwon Do — Jan. 1914 (LiWM); Feb. 1925 (Kur); Sept. 1934 (SSC).

This species is evidently a straggler to Korea, straying occasionally to the eastern coast from the Japanese islands.

80. Aquila chrysaëtos japonica Severtzov

Aquila fulva japonica Severtzov, Nouv. Mém. Soc. Imp. Nat. Moscou, **15**, livr. 5, 1888, p. 182. (Japan.)

English: Japanese Golden Eagle.
Japanese: Inu washi (dog eagle.)

Specimen records:

Pyongan Namdo — 18 Nov. 1912 (Taka).
Hwanghae Do — 22 Jan. 1919 (Taka).

Kangwon Do	— 25 Jan. 1911 (LiWM); 2 Dec. 1929 (Yam).
Kyonggi Do	— Mar. 1909, Feb. 1910, Jan. 1915 (LiWM); 18 Jan. 1918, Sept. 1928 (SSC); Jan. 1925 (2) (Kur); 22 Oct. 1926 (2) (Taka); Mar. 1927 (SoM); 10 Feb. 1933 (USNM); undated (Wolfe).
Chungchong Namdo	— 10 Nov. 1929 (Won).
Korea	— 10 Sept. 1907 (Sapporo Mus).

The Golden Eagle is an uncommon resident in Korea. It nests in small numbers, but is more plentiful as a late autumn and early spring transient, or as a winter visitor.

Colonel L. R. Wolfe, U.S.A., writes me, "I have two sets of eggs of the Golden Eagle from Korea in my collection, both received from Mr. Snyder. The first set of two eggs, one of which was broken, was taken on a ledge in the Chui Ma Mountains, 20 miles southeast of Seoul, and measures 79.1 x 59 mm. The second, a single egg nearly as large as the first and with more markings, was taken from a nest on a cliff at Kum Chum, Hwanghae Do, 4 April 1937. Snyder also sent me one or two Golden Eagle skins from near Seoul." Adachi (1941, 66) says the species nests on the cliffs at Paekto San in Hamgyong Pukto.

I saw a small flight of Golden Eagles near the shore west of Suwon in March 1946. A single bird on March 14th was followed by three more on the 17th, soaring over the tide flats. They did not approach me, nearer than a quarter mile, but the light conditions were excellent, and they could have been nothing else but Golden Eagles.

81. Aquila heliaca ricketti Swann and Wetmore

Aquila heliaca ricketti Swann and Wetmore, Monogr. Bds. Prey, **2**, 1931, pt. 10, p. 42. (Foochow, China.)

English: Chinese Imperial Eagle.

Japanese: Katashiro washi (white-shouldered eagle.)

Specimen records:

Hwanghae Do	— 21 Feb. 1916 (LiWM).
Kyonggi Do	— 1913 (Kur).
Chungchong Namdo	— 1912; Dec. 1934 (SSC).
Cholla Namdo	— 5 May 1916 (SSC); 21 Feb. 1927 (Taka).

This eagle was perhaps once of fairly regular occurrence in Korea as a rare migrant or winter visitor. Today it can hardly be regarded as more than a straggler.

82. Aquila clanga Pallas

Aquila Clanga Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 351. (Russia and Siberia.)

English: Great Spotted Eagle.
Japanese: Karafuto washi (Sakhalin eagle.)

Specimen records:

Kyonggi Do — Mar. 1909, Feb. 1910 (LiWM); Feb. 1915, 21 Jan. 1918 (SSC); Dec. 1924 (Kur); 16 Mar. 1934 (SoM).

This eagle is also of uncertain status in Korea, perhaps occurring rarely but regularly on migration, but more likely as a straggler.

83. Haliæetus albicilla (Linné)

Falco Albicilla Linné, Syst. Nat., ed. 10, **1**, 1758, p. 89. (Sweden.)

English: White-tailed Sea Eagle.
Japanese: Ojiro washi (white-tailed eagle.)

Specimen records:

Hamgyong Namdo — undated (Tacz); 5 Dec. 1912 (Uch); Dec. 1916 (Taka).
Kangwon Do — 18, 21 Dec. 1918, 24 Mar. 1927 (Taka).
Kyonggi Do — Dec., Mar. (3) 1909, 18 Jan. 1914 (LiWM); undated (2) (Tacz); undated (SoM).
Cholla Namdo — Dec. (Kur); Feb. 1920, 30 Jan., 19 Feb. 1927 (Taka).
Kyongsang Namdo — Nov. 1884 (USNM); 20 Dec. 1914 (LiWM).

The White-tailed Sea Eagle is an uncommon winter visitor to coastal Korea. I saw three near Suwon on 11 March 1946, soaring over the salt marshes at the head of an inlet. They were quite shy, and while they did not alight nor come within carbine range, I had an excellent view of them with my binoculars. They were well-marked adults in full plumage, with square white tails.

84. Haliæetus pelagicus (Pallas)

Aquila pelagica Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 343 and pl. (Islands between Kamchatka and America.)

Haliaeetus niger Heude, Naturaliste, 1887 p. 95,. (Mer de Tartarie, = Korea.) (Type formerly in Nat. Hist. Mus., Warsaw.)

Haliaeetus braniekii Taczanowski, Proc. Zool. Soc. London, 1888, p. 451, fig. 1. (Korea.) (Synonym of *niger*.)

English: Steller's Sea Eagle.
Japanese: O-washi (large eagle.)

From the scant evidence available, *niger* appears to be a dark subspecies of *pelagicus*, breeding in eastern continental Asia southwest of the breeding range of *pelagicus*, certainly in Korea, and probably in Ussuria and Dauria as well.

There has been much speculation on the systematic status of *niger*. Delacour and Hachisuka (1928) examined the LiWong specimens and pronounced them melanistic individuals of *pelagicus*. While the Hand-List of Japanese Birds (1942, 111) catalogues it subspecifically, it footnotes "it appears that *niger* may be a melanistic form of *pelagicus*, but we have only limited specimens at our disposal to settle this question."

Some authorities still accord it specific rank, but, while *niger* is apparently characterized by a broader, heavier bill and a shorter tarsus, as well as by the lack of white plumage on the head, neck, shoulders and thighs of the adults, the differences in color and measurements between it and *pelagicus* are not sufficient alone to establish it as specifically distinct, especially as so few specimens have been examined. Likewise, this dark bird is limited in its distribution to Korea and the adjacent portions of Ussuria and Dauria. (A specimen from Ussuria, formerly in the Leningrad Museum, is the only definite record for it outside Korea, though Jankowski (Lavauden, 1912, 4) claims to have seen one in Sidemi, near Vladivostok, and Dybowski may have seen two more on the beach at Onon, Dauria.) As all the Korean breeding records for the species are referable to *niger*, there is nothing to suggest that the two forms may breed in the same territory.

Both melanism and dichromatism occur frequently in the Falconiformes, and sometimes a dark, juvenal-type plumage is retained in adults occupying a well-defined geographical range. (*Haliæetus leucogaster sanfordi* from the Solomons is a closely allied example.) This seems to be the case in *niger*, which assumes the white tail characteristic of the adult of the species comparatively late in life (at the age of five or six years in captive specimens), and never develops the white forehead, shoulders and thighs of *pelagicus*.

Specimen records:

Haliæetus pelagicus pelagicus:

Hamgyong Namdo — Jan. 1917 (Kur); 1912, and Feb. 1917 (SSC).
Kangwon Do — 14 Feb. 1918 (Kur).

Kyonggi Do	— 3 Feb. 1915 (LiWM).
Cholla Namdo	— 24 Dec. 1929 (Yam).

Haliæetus pelagicus niger:

Hamgyong Namdo	— 28 Feb. 1888 (Tacz); 7 Jan. 1927 (Taka).
Pyongan Namdo	— 24 Mar. 1910 (LiWM).
Kangwon Do	— Apr. 1913 (LiWM).
Kyonggi Do	— 20 Nov. 1911 (LiWM); 11 Jan. 1921 (Kur); 29 Jan. 1929 (2) (Taka).
Chungchong Namdo	— undated (SSC).

In addition to these museum records, there have been a number of other specimens of *niger*, originally kept in aviaries, for which there are no accurate collecting data. All were taken in "Korea", and most of them seem to have been collected as nestlings. Heude's type of *niger* was sent alive to Shanghai from "Mer-de-tartaris" (Korea), and was kept for some time in the Zikawei zoo. Another specimen in the Zikawei museum (Courtois, 1912, 6) was taken from a nest in Korea in 1884, and caged in Shanghai until its death in 1908. A specimen in the Marseille Museum (Lavauden, 1912, 1) died in the Marseille zoo in 1897, still in juvenal plumage at the age of three, and three "Korean Black Eagles" formerly in the London, Hamburg and Berlin zoos respectively (*cf.* Lavauden, 1912, Bolau, 1892, and P.Z.S. London 1893, 613), were similarly without data. In his aviary at Atami, Japan, Dr. M. Hachisuka kept for ten years a specimen Shimokoriyama sent him from Korea in 1928. The Koreans who brought it in had cruelly clipped its talons, more likely to use as medicine than to make the bird less dangerous to handle. It was in juvenal plumage when received, developed its white tail at the age of five, and showed no more white on its plumage during the remaining five years Hachisuka kept it before giving it to Hagenbeck, who presumably took it alive to Germany. Hachisuka likewise has photographs of a fine adult *niger* taken in 1928 in the LiWong Zoo. When this bird died in Seoul several years later, Shimokoriyama sent it to Hachisuka in the flesh, but it arrived in Japan too decomposed to preserve.

Thus, counting the Ussuria specimen formerly in Leningrad, there have been eighteen specimens attributed to *niger*. Eight of these eventually reached Europe, Heude's and Taczanowski's types, the Marseille, Hamburg, Berlin, London and Leningrad specimens, and the Hagenbeck bird. How many of these are still in existence is unknown, probably not more than half of them. The remaining ten never left the Orient, but only the three LiWong Museum specimens definitely still exist. The Seoul School collection bird was lost during

the occupation, Taka-Tsukasa's three and Kuroda's single specimens were destroyed in 1945, and nothing has been heard from Zikawei since the war.

H.p.pelagicus is an uncommon winter visitor to Korea, while *H.p. niger* is an uncommon resident, spoken of by Kuroda, Mori and others as being slightly more common than *pelagicus*, which the specimen record verifies. Kalinowski took the type of *branickii* at "Tsempion" (Hamgyong Namdo?) on his return from Seoul to Vladivostok, 28 February 1888, and Taczanowski (1888, 455) speaks of his seeing six or seven more such eagles on the trip, all dark ones. None of the large raptors are as common today in Korea as they seem to have been in Kalinowski's time.

85. Aegypius monachus (Linné)

Vultur Monachus Linné, Syst. Nat., ed. 12, **1**, 1766, p. 122. (Arabia.)
Vultur chincou Daudin, Traité d'Orn., **2**, 1800, p. 12. (A captivity specimen from China, *ex* Levaillant, Ois. d'Afr., pl. xii.)

English: Cinereous Vulture.
Japanese: Hage washi (bald eagle.)

The Japanese regard the Asiatic birds as separable from the European, and assign the Korean specimen to *Aegypius monachus chincou*. As I have seen insufficient material, I prefer to follow the judgment of Hartert, Peters, and Swann and Wetmore, all of whom consider them inseparable.

Specimen records:

Hamgyong Pukto	— 8 Aug. 1929 (Yam); 25 Nov. 1928 (SSC).
Kangwon Do	— 15 Dec. 1918 (Taka).
Kyonggi Do	— 1912 (SSC).
Chungchong Namdo	— Jan. 1913 (LiWM).
Cholla Pukto	— 29 Jan. 1912 (LiWM).
Cholla Namdo	— Nov., Dec. 1912 (Kur).

This species is a rare visitor to Korea, but of too frequent occurrence to be regarded as a straggler. Yamashina (1941, 873) thinks, in view of the bird Orii took in August at Paekto San, "I think some of them live there permanently." He also (*idem*) mentions a Chungchong Pukto specimen of which I cannot find the original source, and a Kyongsang Namdo record, which is probably based on Clark (1911, 156) who says "Mr. Jouy's collections contain the tail of a bird of this species which was secured in Korea."

On 27 January 1946 I watched a large, dark raptor soaring along with a wind current a good thousand feet above Suwon, on motionless wings. It seemed to be bare-headed, but I could not be sure of its identity, before it disappeared over the distant hills and never reappeared to give me a better view.

86. Gypaëtus barbatus aureus (Hablizl)

Vultur aureus Hablizl, Neue Nord. Beytr., **4**, 1783, p. 64. (Prov. of Gilan, Iran.)

English: Bearded Vulture.
Japanese: Hige washi (bearded eagle.)

Specimen records:

Hamgyong Namdo — 1912 (SSC).
Kangwon Do — 21 Dec. 1916 (SSC); 6 Jan. 1918 (Kur).

The Bearded Vulture is a straggler in Korea, known only from the three records above. The collection of the first Kangwon Do specimen is reported by both Kuroda (1917A, 95) and Mori (1917, 41). The other two records, the Hamgyong Namdo bird in the Seoul Nat. Hist. Society collection, and the later Kangwon Do skin in the Kuroda collection, are taken from Yamashina's holograph lists.

87. Circus cyaneus cyaneus (Linné)

Falco cyaneus Linné, Syst. Nat., ed. 12, **1**, 1766, p. 126. (Europe.)

English: Hen Harrier.
Japanese: Hai-iro chuhi (grey harrier.)

Specimen records:

Hamgyong Pukto — 7 Nov. 1929 (Yam).
Pyongan Pukto — 15 Dec. 1912 (LiWM).
Pyongan Namdo — 25 Dec. 1931 (Won).
Hwanghae Do — Dec. (Kur).
Kyonggi Do — Dec. 1887 (Tacz); Oct. 1889 (Camp); 13 Feb. 1909, Feb., Dec. 1910, 15 Jan., 2 Mar. 1911 (LiWM); 20 Dec. 1913 (SSC); 13 Feb. 1928 (Taka).
Cholla Namdo — 6 Mar. 1927 (Taka).
Kyongsang Namdo — 3, 30 Jan. 1884, 2 Feb. 1886 (USNM); 22, 23 Dec. 1914 (3) (LiWM).

The Hen Harrier is a not uncommon winter visitor. Taczanowski (1888, 461) considered it a "quite common resident", but Campbell (1892, 244) saw it only "in autumn, winter and spring." Won (1934, 101) claims it "breeds on high mountains, migrates to the plains in winter", which might be so, but Yamashina (1941, 835) states "breeding there not known."

Judging from the specimen record, the bird arrives in the northern provinces in November, moves down to central and southern Korea in December, remains sporadically in the area through January and February, and departs for the north again sometime in March. I saw two on 7 December 1945 at Suwon, the only ones I encountered during my stay.

88. Circus melanoleucus (Pennant)

Falco melanoleucus Pennant, Indian Zool., 1769, p. 2, pl. 2. (Ceylon.)

English: Pied Harrier.
Japanese: Madara chuhi (spotted harrier.)

Specimen records:

Hamgyong Pukto — 25 July-29 Aug. (1 ad., 3 juvs.), 15 Sept. 1929 (Yam); 28 July 1929 (Won).
Kangwon Do — June 1909 (LiWM).
Kyonggi Do — 30 Apr. 1914 (2) (LiWM); 2 May 1920 (SSC); 19 Sept. 1927 (Taka).

The Pied Harrier is an uncommon summer resident in the northern half of Korea. It is a mainland form whose breeding range probably extends into the northern highlands from Manchuria, as suggested by Orii's collection of three juvenals in the northeastern mountains. Won (1934, 101) says it breeds at Paekto San. It seems to enter and leave the country *via* the Shantung peninsula or Manchuria, as it seldom strays south of Kyonggi Do.

89. Circus aeruginosus spilonotus Kaup

Circus spilonotus Kaup, Isis, 1847, col. 953. (eastern Siberia.)

English: Eastern Marsh Harrier.
Japanese: Chuhi (autochthonous.)

Specimen records:

Hamgyong Pukto — 13 Sept.-12 Oct. 1929 (3) (Yam).
Pyongan Pukto — 21 Apr. 1929 (Yam).
Kyonggi Do — 1 Nov. 1914, 1 Oct. 1916 (LiWM); 7 Jan. 1913, 20 Oct. 1921 (SSC); 21 Nov. 1926, 10 Dec. 1927 (Taka).
Chungchong Namdo — Oct. 1915 (LiWM).
Cholla Namdo — Feb. (Kur).

This species is an uncommon spring and autumn transient, and perhaps a summer resident along the northern border, where it is evidently more common during migrations. There is very little in literature about the bird in Korea, but the 1942 Japanese Hand-List says it "breeds in Hamgyong Pukto", perhaps (though doubtfully, as it makes the same statement in the 1932 edition) based on Won's statement (1934, 100) that it "breeds in the table land and migrates to the plains in winter." Won never collected it, and (*idem*) calls it rare.

PANDIONIDAE

90. Pandion haliætus haliætus (Linné)

Falco Haliætus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 91. (Europe.)
English: Osprey.
Japanese: Misago (autochthonous.)

Specimen records:

Hamgyong Pukto — 2,25 Oct. 1929 (Yam).
Hamgyong Namdo — 25 Oct. 1911, 15 Oct. 1912 (LiWM).
Kyonggi Do — Sept. 1889 (Camp); undated (SSC).
Korea — Oct. 1917 (Taka).

The Osprey is a rare visitor to Korea, and the fact that all the specimens on record were autumn-killed indicates they probably reached the country as post-nuptial wanderers from the nearest known breeding area in southern China. Campbell (1892, 244) says " . . . not often seen in Korea. In addition to the specimen obtained I saw one other hovering over the Yöngheung River (at that time frequented by salmon) in September, 1889." Taczanowski (1888, 459) "saw only solitary examples, in spring and rarely in autumn."

FALCONIDAE

91. Falco cherrug milvipes Jerdon

Falco milvipes Jerdon, Ibis, 1871, p. 240. (Umballa, India.)
English: Hodgson's Saker Falcon.
Japanese: Wakisugi hayabusa (Stripe-sided falcon.)

This continental species is a rare straggler in Korea, known only from the single specimen reported by Taczanowski (1887, 598), taken by Kalinowski 6 January 1887, presumably in Kyonggi Do, for Kalinowski was in Seoul at that time. Taczanowski comments later (1888, 461) on the bird "Resident but rare; its rarity is enhanced by the natives who use it for hunting, which applies also to the Peregrine Falcon and the Goshawk."

92. Falco peregrinus leucogenys Brehm

Falco leucogenys Brehm, Naumannia, 1854, pp. 51, 60. (Germany.)
English: Siberian Peregrine Falcon.
Japanese: Hayabusa (autochthonous.)

Specimen records:

Hamgyong Pukto — 30 Sept. 1929 (2) (Yam).
Hamgyong Namdo — 24 Mar. 1909, 15 Oct. 1912 (LiWM).
Pyongan Namdo — Mar. 1909 (LiWM); 24 July 1932, 23 July 1935 (Won).
Hwanghae Do — Mar. 1915 (LiWM).
Kyonggi Do — 15 Jan., 13 Feb., 5 Mar. 1914 (LiWM); undated (SSC); June 1917 (Kur).
Chungchong Pukto — Apr. 1917 (Kur).
Kyongsang Pukto — mid-April (Kur).
Kyongsang Namdo — 28 Aug. 1884 (USNM); 23 Dec. 1914 (LiWM).

The Peregrine Falcon is an uncommon, irregular visitor to Korea, most common in early spring. Taczanowski (1888, 459) says "sedentary, commonest in winter." Won (1936, 312) assigned one of his Pyongan Namdo specimens to *F. p. peali*, but his judgement has been disallowed by subsequent authors, together with his statement (1934, 99) that the species is "common, breeds on high mountains." The two immature birds which Orii collected in Hamgyong Pukto possibly came south from breeding grounds farther north. Kobayashi and Ishizawa (1940, 233) figure "a clutch of 4 fresh eggs in South Corea 26 March

. . . laid directly on the bare rock on a sea-side cliff without making a nest," on which Yamashina comments (1941, 312) "Imperfect investigation of their breeding; eggs reported from south Korea, but those I saw labelled 'Saishu' were of doubtful parentage." The 1942 Hand-List follows his judgment and lists the species as occurring, not breeding in Korea.

93. Falco subbuteo subbuteo Linné

Falco subbuteo Linné, Syst. Nat., ed. 10, **1**, 1758, p. 89. (Sweden.)

English: Hobby.
Japanese: Chigo hayabusa (little child falcon.)

Specimen records:

Hamgyong Pukto — 24 May 1912 (AMNH); 13 Sept. 1917 (LiWM).
Pyongan Pukto — 26 May 1917 (LiWM); 11–28 May 1929 (4) (Yam).
Kangwon Do — 21 Oct. 1911, 1 Oct. 1914 (3) (LiWM).
Kyonggi Do — Nov. 1909, 27 Sept. 1914 (LiWM); 5 Oct. 1920 (SSC); 10, 25 Oct. 1925, 3 Oct., 11 Nov. 1927 (Taka).

The Hobby is a not uncommon spring and autumn transient, more common in the north nearer the mainland flight lane than it is in the southern provinces, for which there are no specimen records. Taczanowski says (1888, 461) "encountered rarely in spring and autumn between Seoul and Inchon." Won never collected it, and calls it rare. Yamashina, on the basis of Orii's experiences (1941, 726) says "many can be seen in spring."

94. Falco columbarius insignis (Clark)

Aesalon regulus insignis Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 470. (Fusan, Korea.)

English: Asiatic Merlin.
Japanese: Kochogenbo (small kestrel.)

Specimen records:

Hamgyong Pukto — 18 Oct. 1929 (Yam).
Pyongan Pukto — 9 Nov. 1930, 10 Nov. 1933, 12 Dec. 1935 (Won).
Kyonggi Do — Dec., Feb. 1887 (Tacz); 1 Oct. 1888 (Camp); Mar. 1910 (LiWM); 7 Oct. 1914 (SSC); 18 Mar. 1917 (Kur); 3 Feb., 12 Dec. 1918, 15 Sept. 1926, 18 Jan. 1928

(Taka); 23 Nov. 1929 (Won); 15 Feb. 1934 (SoM); 6 Apr. 1946 (MCZ).
Chungchong Namdo — Dec. 1910 (LiWM).
Cholla Namdo — 2 Dec. 1927 (Uch); 22 Jan. 1930 (Yam).
Kyongsang Namdo — 12 Mar., 23 Nov. 1884 (USNM); 14 Dec. 1914 (LiWM).

The Merlin is an early spring and late autumn transient. It is not uncommon, and a few occasionally winter in the southern provinces. Taczanowski (1888, 461) says "rare and seen only in winter." Won (1934, 100) claims it is common and that it breeds, in which he is mistaken. I collected the only one I saw, an adult male, at the beginning of the hawk flight at Suwon, on 6 April 1946.

95. Falco vespertinus amurensis Radde

Falco vespertinus var. *amurensis* Radde, Reisen sud von O.-Sibir., **2**, 1863, p. 102, pl. 1, f. 2a, 2b. (Amur.)

English: Eastern Red-footed Falcon.
Japanese: Aka ashi chogenbo (red-footed kestrel.)

Specimen records:

Hamgyong Pukto — 6 Sept.-11 Oct. 1929 (3) (Yam).
Pyongan Pukto — 19 June 1917 (LiWM); June 1917 (Kur).
Kyonggi Do — 20 Oct. 1921 (SSC).

This falcon is an uncommon transient, perhaps a summer resident in the extreme north. Won (1934, 100) calls it rare. Yamashina (1941, 737) nicely sums its probable status, "collected in Pyongan Pukto and Hamgyong Pukto on migration. Many breed in eastern Manchuria, so perhaps it may eventually be found to breed in northern Korea."

96. Falco tinnunculus interstinctus Horsfield

Falco interstinctus Horsfield, Proc. Zool. Soc. London, 1839 (1840), p. 154. (Assam.)
Cerchneis perpallida Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 470. (Fusan, Korea.) (Aberrant, *cf.* Peters, 1931, 298.)

English: Kestrel.
Japanese: Chogenbo (autochthonous.)

The subspecific status of the eastern Asiatic Kestrels needs further clarification, which is not possible until more breeding-ground material

is available. I believe the northeastern Siberian bird will prove separable from *tinnunculus* of northern Europe and western Siberia as being paler, and perhaps slightly larger. The name *perpallida* is available for it, being prior to Swann's *dörriesi* from Amurland. My four winter birds, and most of the Korean migrants are referable to the southern race, *interstinctus*. The 1942 Japanese Hand-List, however, assigns Clark's type of *perpallida*, taken at Fusan, Kyongsang Namdo 6 April 1884, and Orii's single Hamgyong Pukto specimen, taken 21 October 1929, to the northern race, which it calls *F. t. tinnunculus*, synonymizing thereunder both *perpallida* and *dörriesi*. It will probably be proved eventually that two races of Kestrel occur in Korea, the larger, paler northern bird as an uncommon spring and autumn transient, and the smaller, darker, southern subspecies as the common wintering form. But until more material is available to clarify the situation, I prefer to consider the questionable specimens as possible aberrant individuals, and to refer them provisionally to *interstinctus*.

Specimen records:

Hamgyong Pukto — 21 Oct. 1929 (Yam).
Pyongan Namdo — 23 Oct. 1932 (SSC); 13 Nov. 1931, 29 Nov. 1935 (Won).
Kangwon Do — 29 Nov., 24 Dec. 1929 (3) (Yam).
Kyonggi Do — 23 Sept. 1883 (USNM); Jan., Mar., June, July 1887 (Tacz); Mar., Nov. 1909, 25 Apr. 1913, 10 Oct. 1914 (LiWM); 18 Mar., May 1917, 17 May 1919 (Kur); 3 Feb. 1918, 5 Oct. 1926 (2), 15 Mar., 8, 10 Dec. 1927, 27 June 1930 (Taka); 9 Nov. 1929, 29 Dec. 1930 (Won); 10 Jan. 1933 (Uch); Mar. 1934 (SoM); 6, 27, 29 Jan., 14 Mar. 1946 (MCZ).
Kyongsang Namdo — 6 Apr. 1884 (USNM); 14, 25 Dec. 1914 (LiWM).

The Kestrel is a common migrant throughout, and a common winter resident in the south and central portions of Korea. Taczanowski (1888, 461) considered it "resident, the commonest of the diurnal raptorines." I found it the common small hawk of the Suwon area from December until early April. While it is frequently seen coursing at random over the open paddies and uplands, and occasionally pursuing small passerines in the woodlands, its favorite method of hunting is to hover on quivering wings over the rice-straw stacks, pouncing suddenly on the first venturesome harvest-mouse careless enough to show itself. As the hawk flight materialized in April, the Kestrels quickly disappeared, moving northward with the vanguard.

TETRAONIDAE

97. Lyrurus tetrix ussuriensis (Kohts)

Tetrao tetrix var. *ussuriensis* Kohts, in Lorenz, Birkhühner Russland, 1911, p. 3. (Ussuri Region.)

Lyrurus tetrix koreensis Mori, Tori, **6**, 1929, p. 100 (English text p. 107), pl. 2 (lettered *coreensis*). (Korea.) Synonym.

English: Ussurian Black Grouse.

Japanese: Kuro raicho (black thunder-bird.)

Mori (1929, 100) described *koreensis* from a single male collected in northern Korea in 1927, but other specimens from the same locality are not separable from those of Ussuri.

Specimen records:

Hamgyong Pukto — 25 May 1912 (AMNH); 24 Oct. 1927 (SSC); 10 May 1929, 21 Jan. 1930 (Won); 10 Aug. 1929 (MCZ); 11, 26 Aug. 1929 (Yam).

Hamgyong Namdo — Winter, 1932 (Mori).

The Black Grouse is limited in Korea to the northwest highlands in Hamgyong Pukto and northern Hamgyong Namdo, where it is resident, and probably not uncommon. Won (1934, 117) says it is common on the east side of Paekto San.

98. Tetrastes bonasia amurensis Riley

Tetrastes bonasia amurensis Riley, Proc. Biol. Soc. Wash., **29**, 1916, p. 17. (Siberia, from Ussuriland to Manchuria.)

Tetrastes bonasia coreensis Kuroda and Mori, Auk, **39**, 1922, p. 365. (Kangwon Do, Korea.) Synonym.

English: Amur Hazel Grouse.

Japanese: Chosen Yezoraicho (Korean Hokkaido-thunder-bird.)

The authors of *coreensis* note in their original description that one of their Kangwon Do specimens is indistinguishable in its diagnostic characters from a specimen from Amuria. I find the Korean specimens in the Museum of Comparative Zoölogy and the American Museum of Natural History to be inseparable from a series of Amuria and north Manchuria birds. The breast character is due to age and feather-wear, and the head character is neither unique nor constant. In fact two north Manchuria skins have greyer heads than any of the Korean specimens.

Specimen records:

Hamgyong Pukto — 15, 30 Apr. 1912 (AMNH); 14, 15 Aug. 1917 (4) (LiWM); 25 Aug., 1 Sept. 1929 (Yam); 10 Aug. 1929 (Won); Feb. 1927 (Kur).
Hamgyong Namdo — Nov., Dec. 1887 (3) (Tacz); 1, 2 Nov. 1931 (Won); Jan. 1928 (SoM).
Pyongan Pukto — 24 Mar. 1910 (LiWM).
Hwanghae Do — 18 Nov.-23 Dec. 1926 (6) (Taka).
Kangwon Do — 20 Mar. 1917 (LiWM); 3 Nov. 1914, 1 May 1934 (2) (Kur); Jan. 1921, 28 Mar. 1928 (SSC); 6, 9 July 1929 (Yam); Dec., May 1934 (USNM); 10 Jan. (2), May (4) 1934 (MCZ).
Kyonggi Do — 11 Nov. 1888 (Camp).

The Hazel Grouse is a locally common resident in the forested mountain areas from Kangwon Do northward. Taczanowski (1888, 467) wrote "resident and fairly common between Seoul and Wonsan, not encountered north of Wonsan, absent in the south of the peninsula." Campbell (1892, 248) says it "sometimes appears in the market at Seoul, but not in any great numbers. I found it resident in the forests south of Paiketo San where it appeared to be plentiful."

Y. Kuroda wrote (1935, 518) about his experiences with the species near Hoeryang, Kangwon Do on 1 May 1934, ". . . in a valley full of large boulders and thriving deciduous trees. It had snowed April 28th, and three or four inches of snow still remained on the north side of the mountain, but the south slope was warm and delightful. The birds seem to feed in the morning, assembling in the lowlands. In the afternoons they gather in higher places, most of them perching on trees. . . . In the season of bitterest cold they travel around the mountainside in flocks of twenty to thirty birds. It was now breeding season, and most of them were found alone. I heard the male singing often. When approached they fly up into a tree, tail stretched out and crest erect. They can be shot very easily. I could not find a nest, but a female I collected contained an egg ready to be laid the next day."

PHASIANIDAE

99. Coturnix coturnix japonica Temminck and Schlegel

Coturnix vulgaris japonica Temminck and Schlegel, in Siebold, Fauna Jap., Aves, 1849, p. 103, pl. 61. (Japan.)

English: Japanese Quail.
Japanese: Uzura (autochthonous.)

Specimen records:

Hamgyong Pukto	— 15, 18 Aug., 22 Sept., 22 Oct. 1929 (Yam).
Pyongan Pukto	— 4, 11 May 1929 (Yam); 28 Dec. 1927 (Won).
Pyongan Namdo	— 12 May 1917 (LiWM); 21 Nov. 1932 (SSC).
Kangwon Do	— 3, 8 Oct. 1914 (LiWM).
Kyonggi Do	— 11 Nov. 1883 (USNM); Mar. 1909 (2), Dec. 1910 (LiWM); 20 Apr. 1917 (Kur); 23 Nov. 1923 (2), 24 Oct. 1926 (2), 26 Sept.-6 Oct. 1927 (8) (Taka); 20 Dec. 1929 (SSC); 4 Mar. 1929 (Won); 5 Dec. 1945 (MCZ).
Cholla Namdo	— 22 Oct. 1928, 30 Aug. 1929 (Uch); 17 Jan. 1930 (Yam).
Kyongsang Namdo	— 21 Nov. 1885 (USNM).

The Japanese Quail is a not uncommon summer resident in the five northern provinces. It is a common autumn transient throughout Korea, and some winter in the southern half of the peninsula. Taczanowski (1888, 467) found it "very abundant between Seoul and Wonsan in winter, rarer farther north." Won (1934, 118) collected it in "many localities, also at the foot of Paekto San; common, breeds." Yoshida (1923, 317) observed it in the northwestern provinces in mid-July. Kobayashi (1932, 71) shot several in Hwanghae Do, 23 March, 1931.

Yasukichi Kuroda has written extensively about this species, which he was very fond of hunting. He gives (1928) the shooting season as from September to February; the best shooting near Seoul is in late September and early October; farther south it is better from mid-October to November; in coastal Hwanghae Do it is best in November. He notes late nesting [perhaps early arrival of young migrants] in Kyonggi Do, saying "we often find young birds, unable to fly, with soft yellow bills, in the brush near Seoul from the last of August to early October." He describes (*idem*) the various Korean methods of hunting: first by falconry, which is not so successful with quail as with pheasants; next by clap nets at dawn, which yields from thirty to forty birds per day; and finally the "Kangwon Do method," where boys build little funnels of straw which they set in the fields. The quail creep into them to sleep at night, and the boys go round and kill them with sticks as they lie. He saved many crop and stomach contents of birds he shot, and gives lengthy and detailed analyses of them.

In his last paper (1937, 313–319) he gives an account of the autumn migration near Chongjiu, Chungchong Pukto: "Quails are not seen before the early part of September; their arrival seems to coincide with the ripening of *Eriochloa villosa* Kunth, and the number increases as time goes by. They are seen in step-patterned paddy-field areas where

they wait for the water to dry up, and in dry rice fields and bean patches. They do not flock together. They are most numerous between the 24th and 25th of October and the first ten days of November, the period when the rice is harvested. By the middle of November, the crops from the paddy-fields having been stored away, the birds are left without any 'base of operations,' thus, while a few remain along the foot-paths between the fields, a portion gather in the willow fields along the river, and the majority move on to the valley areas in the hills. They are seldom seen in December, the greater portion having migrated south; only a few spend the winter there, and are seen rarely in the barley fields around the end of April or the first part of May. These wintering birds are mostly females; males have not yet been observed in winter and spring. They feed chiefly on larvae of the white butterfly. Only a very small number migrates northward; they seem to go around the middle of March. Northward migration is not observed between May and the end of September."

100. Phasianus colchicus Linné

Phasianus torquatus pallasi Rothschild, Bull. Brit. Orn. Club, **13**, 1903, p. 43, new name of *P. t. mongolicus* "Pallas" Rothschild, not of Brandt. (lower Sidemi River.)

Phasianus karpowi Buturlin, Orn. Monatsb., **12**, 1904, p. 3. (Te-lin, southern Manchuria.)

English: Ring-necked Pheasant.
Japanese: Korai kiji (Korean pheasant.)

Much has been written by the Japanese on the racial differentiation of the pheasants in Korea, the two most thorough papers being those of Morikawa (1925) and of Mori (1925). The former had a tremendous series (2113!) of birds from Manchuria and northern Korea, but not being a biologist, his deductions were considerably at variance with the evidence, which N. Kuroda took pains to set right in a corrective summary in letter form published in "Tori" following Morikawa's article. Mori's summation, however, is excellent, and hard to improve upon, though the 1942 Hand-List restricts his southern boundary of the range of *pallasi*. From what I have seen of the material, I am inclined to agree entirely with Mori, whose thesis is as follows:

The only difference between the pheasants ranging from Quelpart Island to Manchuria is in coloration. A large series of measurements and weights shows only individual variation. (Mori measured length and width of bill, length of tail, wing and tarsus, and width of neck-

ring both anteriorly and posteriorly.) The differences between the two extremes are mainly that the northern form, *pallasi*, is a lighter-colored, paler bird, "not nearly so beautiful as the Korean kiji"! There are minor color characters, such as in the width of the neck-ring, the shade of the light stripe over the eye, and the white spot in the dark neck feathers, but none of them is definitive except in large series. He limits pure *pallasi* to Hamgyong Pukto, northern Hamgyong Namdo, and northern Pyongan Pukto. Pure *karpowi* he shows as from Quelpart Island north roughly to the 37th parallel, southern Kyonggi Do and Kangwon Do. The intervening territory is occupied by an intergrade bird. The more recent revisions have done little to change this judgement of the case, except to limit *pallasi* to northern Hamgyong Pukto, and to consider the bulk of Korea to be occupied by *karpowi*.

The list of specimens on record is omitted as being too lengthy and of no particular value. There are birds in all collections, from every province, for almost every month of the year.

The Ring-necked Pheasant is a common resident throughout Korea, remarkably able to hold its own and to thrive in so desolate a land, in fierce competition with other animals, the worst of which is man. I found it common in my section, and had no trouble in locating a covey whenever I craved a change in diet from army rations. Shot-gun shells were so scarce, however, that I seldom wasted them on pheasants. I hoarded my precious supply to use on species needed for the collection, and shot all my 'eating pheasants' with a carbine. This is not at all difficult, for in winter the birds often feed quietly in the open fields, and I have killed as many as six in a two hour drive along the back roads in a jeep. Even in the dead of winter, after the Koreans had swept the ground surface clean of all cover, every pheasant was fat and plump, with a crop full of various seeds.

There is a set of eggs in the LiWong Museum, taken in Kyonggi Do, 1 June 1910. Kuroda (1925, 15) writes "It breeds usually in May in central Korea. The eight eggs from a clutch obtained at Issan [Kyonggi Do] 24 V 1919 measure 40.5–43.5 mm. by 32.5–34 mm."

TURNICIDAE

101. Turnix tanki blanfordii Blyth

Turnix blanfordii Blyth, Journ. As. Soc. Bengal, **32**, 1863, p. 80 (Burma and Arrakan.)

English: Burmese Button Quail, Hemipode.

Japanese: Chosen mifu uzura (Korean three-spotted quail.)

Specimen records:

Pyongan Pukto — 23, 24 May 1929 (Yam).
Pyongan Namdo — 2 Sept. 1932 (Won); 26 Sept. 1932 (SSC).
Kyonggi Do — 8 Nov. 1914 (LiWM); Nov. 1923 (2) (Kur); 27 Oct. 1930 (Won).
Cholla Namdo — 29 Sept. 1928, 4 Oct. 1931 (Uch).
Korea — 22 Nov. 1919 (MCZ).

This species is an uncommon summer resident in northern Korea, and, from the record, an uncommon transient elsewhere in Korea. It is perhaps more common, especially in migration, than the record indicates. The following account is taken from Taka-Tsukasa's unpublished manuscript:

"Dr. T. Mori has written me that Blanford's Hemipode migrates from Manchuria, but that its numbers vary considerably from year to year, and it is more numerous in northern Korea. A few come to central and southern Korea along with the flocks of Quail, but never in flocks of its own kind. Mr. H. K. Won says it is generally seen in Korea at the foot of mountains bordering fields, or on grassy plains. It breeds in northern Korea. Won writes (*in litt.*) he found an unfledged juvenal near Anjiu [Pyongan Namdo] 2 September 1932, but never found the nest itself until 10 September 1935, when he collected a complete clutch in the forest there. The next year he found a nest and eggs near Anjiu 15 June 1936, which is now in the Yamashina collection. He also found young chicks on Paekto-San in August."

GRUIDAE

102. Grus grus lilfordi Sharpe

Grus lilfordi Sharpe, Cat. Bds. Brit. Mus., **23**, 1894, p. 250 (in key), p. 252. (No type locality = eastern Siberia.)

English: Eastern Common Crane.
Japanese: Kuro tsuru (black crane.)

Specimen records:

Kangwon Do — 10 Nov. 1914 (LiWM).
Kyonggi Do — Jan. 1917 (Kur); 5 Feb. 1916 (SSC).
Chungchong Do — Apr. 1932 (Yam).
Korea — 1 Jan. 1918 (Taka).

This is the rarest of the cranes in Korea. It was formerly of regular occurrence as a winter visitor, though never as abundant as the other three species. Today it is hardly more than a straggler. Y. Kuroda (1937, 307) says "In the past a few scores of black cranes could be observed occasionally, mixed in with the flocks of white-naped cranes, but we see very few of them today."

103. Grus monacha Temminck

Grus monacha Temminck, Pl. Col., livr. 94, 1835, pl. 555. (Hokkaido and Korea.)

English: Hooded Crane, White-headed Crane.
Japanese: Nabe tsuru (pot (?) crane.)

Specimen records:

Hamgyong Namdo	— 4 Jan. 1911 (2) (LiWM); 23 Nov. 1913 (Kur); 2 Dec. 1913 (Taka).
Pyongan Namdo	— 8 Apr. 1932 (Won).
Kyonggi Do	— March 1909, Apr. 1910 (LiWM); 24 Dec. 1940 (2) (MCZ).
Chungchong Namdo	— 12 Feb. 1914 (SSC).
Cholla Namdo	— 7, 13, 17 Feb. 1915 (LiWM); 9, 19, 20 Jan. 1927 (Taka); Jan. (Kur); 15 Jan.-11 Feb. 1930 (5) (Yam).
Kyongsang Pukto	— Dec. 1900 (MCZ).
Kyongsang Namdo	— 11 Dec. 1883 (USNM).

The Hooded Crane is a not uncommon winter visitor in Korea, usually arriving in late November or early December, and departing in March. Y. Kuroda (1937, 308) says it "arrives in its greatest numbers a month behind the white-naped crane . . . and in heading north it is ahead of the rest and seems to start . . . in February." In Hwanghae Do, Kobayashi (1931, 75) saw two on 21 March and his latest one on 26 March.

I saw a pair near Suwon 12 January 1946, but the flight did not start to move through until 10 February when a flock of about two hundred appeared, the largest I saw. Smaller bunches were seen off and on through the rest of February, usually from five to twenty-five birds, and the last of them were three groups of about fifty birds each with an immense congregation of White-naped Cranes on 10 March.

104. Grus japonensis (P. L. S. Müller)

Ardea (*Grus*) *Japonensis* P. L. S. Müller, Natursyst., Suppl., 1776, p. 110. (Japan.)

English: Manchurian Crane, Japanese Crane.
Japanese: Tancho (red top.)

A crane taken at Kapung, Kyonggi Do, 21 February 1917 and purchased by Mori (1917, 43) for the Seoul School collection (*cf.* Kuroda 1917, 24 and 1917A, 95) was identified by him as *Grus nigricollis* Przevalski. This form is accorded specific rank by Peters (1934, 151) as a resident of high central Asia, recorded in winter from Yunnan and Tonkin. The Korean specimen, from the written description, seems to be a melanistic *japonensis*. Delacour and Hachisuka (1928, 504) examined it on their trip to Seoul and pronounced it a probable hybrid between *G. japonensis* and *G. vipio*. The 1942 Hand-List omits *nigricollis*.

Specimen records:

Hwanghae Do	— 2 Jan. 1916 (LiWM); 3 Jan. 1917 (SSC); Mar. 1925, 1 Nov. 1930 (Won); 5 Jan., 25 Feb., 10 Mar. 1927 (Taka); Mar. 1930, 1 Dec. 1930 (SoM).
Kangwon Do	— Apr. 1931 (Sendai Mus.); Apr. 1931 (2) (Yam).
Kyonggi Do	— undated (2) (Tacz); Jan., Feb. 1909 (LiWM); 25 Mar. 1929 (2), 21 Jan. 1946 (MCZ).
Chungchong Namdo	— 31 Dec. 1916 (LiWM); 26 Dec. 1926, 10 Jan. 1927 (Taka).
Cholla Namdo	— undated (1942 Hand-List from 1922 H.L.).
Kyongsang Namdo	— undated (1942 Hand-List from 1922 H. L.).

The Japanese Crane is a common winter visitor, the second most abundant of the cranes in Korea. Campbell (1892, 247) writes "The first icy wind brings the Manchurian Crane down in small numbers from the north . . . generally in October. Later on large flocks may be seen. . . . During the winter many are snared for export to China and Japan, where they are held in high esteem as birds of ornament."

As with the other species, it was formerly more abundant than it is now. Taczanowski (1888, 468) considered it in his day the most abundant of the cranes, and wrote "Common in winter from the Russian frontier to Seoul, rare farther south." Y. Kuroda (1937, 307) says that now [in Chungchong Pukto] "they can be found only in two or three extremely limited areas in flocks of twos or threes . . . However they are constantly attacked by poachers and are almost at the point of extermination." He gives their arrival there as early December,

coincidental with the Hooded Cranes, about a month later than the White-naped.

The species winters haphazardly in central Korea, seeking sheltered locations where there is food and open water. Mori (1939, 5) notes "Many Japanese Cranes are found in winter in the coastal hot-spring districts in Hwanghae Do." It does not seem to visit the southernmost provinces as frequently as do the other two common species, but remains in the plains areas of the west coast from Hwanghae Do to Chungchong Namdo.

Though I had heard of its presence earlier, I saw my first "Tancho" near Suwon 10 January 1946, and collected the second bird I encountered 12 January 1946. From 25 January on it became fairly common in the vicinity, and scattered pairs, trios and small flocks up to a dozen individuals could be found frequenting the larger paddies and open salt marshes. I saw thirty in one flock 10 February, and they increased markedly in numbers the middle of the month. They started to dwindle in early March as the other two species became more common, but though outnumbered, the big white birds were always highly noticeable whenever present in the mixed flocks. I saw 22 on 10 March, and the last were a flock of eight which I observed alone on the 14th and again on 17 March. Kobayashi (1932, 70) observing the flight closely in Hwanghae Do, saw the last of them, a flock of 80, leave 21 March 1932. Y. Kuroda and Miyakoda (1919) give a late record for a flock of 50 observed in Kyonggi Do 4 April.

105. Grus vipio Pallas

Grus Vipio Pallas, Zoogr. Rosso-Asiat., **2**, 1811, p. 111. (Transbaicalia.)

English: White-naped Crane.

Japanese: Manazuru (true-named crane.)

Specimen records:

Hwanghae Do	— Dec. 1916 (Taka); 20 Mar. 1929 (SSC); 20 Mar. 1929 (SoM).
Kyonggi Do	— Mar. 1888 (2) (Tacz); Jan. (2), Mar. 1909 (LiWM); 1916 (Kur); 21 Jan., 25, 28 Feb. 1919 (Taka); Mar. 1936 (USNM); 10 Mar. 1940 (MCZ).
Chungchong Pukto	— 15 Dec. 1910 (LiWM); 1 Mar. 1914 (SSC); 6 Mar. 1935 (2) (Kur).
Chungchong Namdo	— 3, 4 Jan. 1927 (5) (Taka).
Cholla Namdo	— undated (SSC); 29 Jan. 1930 (Yam); Jan. 1938 (Kur).
Kyongsang Namdo	— 6 Dec. 1883, 8 June 1884 (USNM).

The White-naped Crane is a common winter visitor, the most abundant of the wintering cranes in Korea. From all accounts it, too, in common with the other species, has suffered considerable decimation in the last few decades with the encroachment of civilization, particularly from firearms, on its wintering grounds.

Y. Kuroda (1937, 307-312) writes ". . . up to the latter part of the Taisho era [circa 1925] flocks of two or three thousand were common, but since then the number has decreased yearly, and today flocks of only several hundred are to be seen in restricted areas. The first flocks arrive in Hoengsong and Wonju [southwestern Kangwon Do] from the latter part of October to the first part of November. They head south from Yoju [southeastern Kyonggi Do], entering Chongiu [Chungchong Pukto], and the vanguard is seen between 10 and 15 November, right after the rice harvesting. . . . Most of them remain in this area and by the middle of December the number is increased successively by the arrival of later groups. By the end of December the number is at its peak, sometimes totalling over a thousand. However, when the freezing season sets in they again start moving south, though several hundred of the late arrivals remain behind. . . .

"The areas where the cranes stay must have an abundance of clear rivers and sand plains of coarse granitic material. The topography must consist of a cultivated plain with an adjoining belt of low hills running in all directions or a well-drained basin surrounded by hillocks. For feeding grounds the birds prefer dry areas with high humidity to spots with pools of water. Since the size of the ideal areas is determined to a large extent by the amount of snow, the number of birds present is greatly affected by the amount of snowfall. . . .

"In Chinchon [northeast Chungchong Pukto] are several places particularly suited to accommodate large flocks, and flocks of several thousand in this area are not uncommon. This district covers several ri [2.44 miles] consisting of a broad plain with many clear rivers and feeding grounds, as well as a belt of low, rolling hills ten meters high running in all directions. . . . Since the layout is so ideal, the birds when tired of eating, sleep together in the plains, and if the weather becomes very bad with high gales, they take shelter in the hills and hunt for food there. During the freezing season they congregate in small groups on the sunny side of the hills in search of edible grass roots by the paths between the melting ricefields. The paths are built on hilly ground, and since the pine growth there is low, it is easy for them to see intruders. . . .

"They subsist largely on unhulled rice from November to early

January, and live chiefly on grass roots after that, although, depending on the year, they eat sprouting barley in the latter part of February."

Professor Mori (1939, 5, 6) writes "At first they stay in great flocks in Hwanghae Do. When it becomes cold they divide into smaller flocks and retire to such hot-spring districts as Yonbaek and Ongjin in Hwanghae Do. Most of the White-naped and Hooded Cranes move southward to Chungchong Pukto and Chungchong Namdo in December, where they gather in sunny ponds in the plains where it is only partially frozen over. Many of the White-naped Cranes stay there until the end of February.

"A part of the White-naped and Hooded Cranes go yet farther south to Cholla Namdo and winter there, while others migrate to Kagoshima and Yamaguchi provinces in Japan. . . . When cranes were more numerous hunting was permitted in Cholla Namdo to avoid damage to the barley, wheat and purple clover fields. Several hundred were killed annually in Haenam Kun where they were most numerous every year. . . . We cannot express with pen and ink the magnificent sight of cranes circling in a flock leisurely against a blue sky."

The White-naped Cranes arrived in Suwon a little later than the others, the first I observed being two on 7 February. But they soon outnumbered the Japanese Cranes, and the largest groups were seen during the first ten days of March. On 10 March I encountered one flock of well over 500 birds, evidently migrating in a body, for they all disappeared shortly afterward, and I saw the last few stragglers on 17 March. Kobayashi (1934, 4087) found it abundant in Hwanghae Do 11 March, and noted its departure 19 March.

RALLIDAE

106. Rallus aquaticus indicus Blyth

Rallus indicus Blyth, Journ. As. Soc. Bengal, **18** (2), 1849, p. 820. (India.)

English: Eastern Water Rail.

Japanese: Kuina (autochthonous.)

Specimen records:

Kyonggi Do — 6 Nov. 1914, 22 Oct. 1916 (LiWM); undated (SSC); 28 Oct. 1930 (SoM); 25 Nov. 1926, 12 May 1930 (3) (Taka).

Very little is known about the status of the Water Rail in Korea. From the specimen record it appears to be a rare transient. But it is a

shy and secretive bird, and its distribution in surrounding areas, breeding in Japan, Amuria, Ussuria and eastern China and wintering to southeastern China, suggests it should be of more regular occurrence and greater abundance in Korea.

107. Porzana pusilla pusilla (Pallas)

Rallus pusillus Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 700. (Dauria.)

English: Eastern Baillon's Crake.
Japanese: Hime kuina (princess rail.)

Specimen records:

Hamgyong Pukto — 26 Sept. 1917 (LiWM); 16 Oct. 1929 (Yam).
Pyongan Pukto — 26 May 1917 (LiWM); 30 May 1929 (Yam).
Pyongan Namdo — 13 May 1933 (Won).
Kyonggi Do — 29 May 1887 (Tacz); 20 Oct. 1912 (SSC); Oct. (Kur); 10 Oct. 1913, 13 May 1917 (2) (LiWM); 19, 19, 29 Apr. 1927 (Taka).

This crake is a late spring and early autumn transient in Korea, and perhaps a summer resident in the northern half. Won (1934, 117) says it breeds there, but there is no evidence to that effect. Though it breeds in Honshu and Hokkaido as well as in northern China and Amurland, the 1942 Japanese Hand-List does not consider it as a breeding species in Korea.

108. Porzana fusca erythrothorax (Temminck and Schlegel)

Gallinula erythrothorax Temminck and Schlegel, in Siebold, Fauna Jap., Aves, 1849, p. 121, pl. 78. (Japan.)

English: Japanese Ruddy Crake.
Japamese: Hi kuina (red crake.)

Specimen records:

Kangwon Do — 13 July 1929 (Yam).
Cholla Namdo — 27 Oct. 1924 (Uch).

As the presence in Korea of the Japanese Ruddy Crake is known only from the two records above, it is probably not of regular occurrence, and must be regarded as a straggler.

109. Porzana paykullii (Ljungh)

Rallus Paykullii Ljungh, Kungl. Svenska Vet.-Akad. nya Handl., **34**, 1813, p. 258, pl. 5. (Borneo and Java.)

English: Siberian Ruddy Crake.
Japanese: Korai hi kuina (Korean red crake.)

Specimen records:

Pyongan Pukto — 31 May 1917 (LiWM); 26 May 1929 (Yam).
Pyongan Namdo — 16 Sept., 26 Oct. 1932 (Won).
Kangwon Do — undated (Hand-List 1942).
Hwanghae Do — Aug. 1927 (Won).
Kyonggi Do — 20 May 1910 (LiWM); 31 May 1913 (SSC); July 1917, Oct. (Kur); 20 Nov. 1929 (Taka).

This species is a not uncommon late spring and early autumn transient, and perhaps a summer resident from Kyonggi Do northward. Taczanowski (1888, 459) says it is "rare in winter in the rice lands." Mori (1917, 74) collected it during his trip along the northwest coast in the spring of 1917. Won (1934, 117) says it is common and breeds, in which the 1942 Hand-List does not concur.

110. Porzana noveboracensis exquisita Swinhoe

Porzana exquisita Swinhoe, Ann. and Mag. Nat. Hist. (4), **12**, 1873, p. 376. (Cheefoo, China.)

English: Swinhoe's Crake.
Japanese: Shima kuina (striped crake.)

Specimen records:

Pyongan Pukto — no data (Hand-List 1942).
Kyonggi Do — 6 Nov. 1914 (LiWM); 5 Oct. 1913, 23 Oct. 1927 (SSC); Oct. (Kur); 29 Apr. 1930 (2) (Taka); 28 Oct. 1930 (SoM).

This species is an uncommon transient in Korea. Mori (1917, 74) took one on the northwest coast in the spring of 1917 which may be the source of the 1942 Japanese Hand-List's Pyongan Pukto record. There is no other mention of it in Korean literature, but as it is known to breed in southern Ussuriland, it may eventually prove to be a summer resident in northern Korea as well.

111. Gallinula chloropus indica Blyth

Gallinula chloropus? var. *indicus* Blyth, Journ. As. Soc. Bengal, **11**, 1842, p. 887. (Calcutta.)

English: Indian Water-hen, Moorhen.
Japanese: Ban (autochthonous.)

Specimen records:

Kyonggi Do — 5 May 1916 (LiWM); 19 Apr. 1927 (Taka).
Kyongsang Namdo — April 1923 (Kur).

The Indian Moorhen is known in Korea only from the three scattered records above. As there is no other mention of the species in Korean literature, it can be regarded only as a straggler. However, perhaps because it nests commonly in Japan and elsewhere in neighboring eastern Asia, the 1942 Hand-List regards it as breeding in Korea.

112. Gallicrex cinerea (Gmelin)

Fulica cinerea Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 702. (China.)

English: Kora, Water-cock.
Japanese: Tsuru kuina (crane crake.)

Specimen records:

Hamgyong Pukto — 16 July 1894 (Kur., *ex* Owston).
Pyongan Pukto — 19 June 1917 (2) (LiWM); 31 May, 3 June 1929 (Yam).
Pyongan Namdo — 22 Oct. 1932, 13 May 1933 (Won).
Kangwon Do — 25–29 June 1929 (3) (Yam).
Kyonggi Do — June, July 1909 (4), Aug. 1910, 12 Oct. 1914, 20 June, 5 July 1915 (LiWM); 23 May 1913, 15 July 1928 (SSC); Sept. 1916 (Kur); 25 Apr. 1918, 14 Nov. 1926, 30 June, 9, 24 July 1927 (Taka); 20, 21 June, 28 Oct. 1929 (SoM); 20, 25 June 1927, 20, 22 June, 5, 7 July 1929 (Won).
Chungchong Namdo — 3 June 1894 (Kur., *ex* Owston).
Cholla Namdo — 14 Oct. 1931 (Uch).
Kyongsang Namdo — 28 June 1885 (USNM).

The Water-cock is a common summer resident, arriving in late April, and departing in early November. Taczanowski (1888, 468) says it "nests in small numbers in the rice fields, leaves the country for winter." Won (1934, 117) also calls it common and breeding. He col-

lected five eggs 10 July 1938 in Pyongan Namdo, which are now in the Yamashina collection. Kobayashi and Ishizawa (1933, 51) figure a clutch of four eggs collected in Kyonggi Do 19 July, which were formerly in the Kuroda collection.

113. Fulica atra atra Linné

Fulica atra Linné, Syst. Nat., ed. 10, **1**, 1758, p. 152. (Sweden.)
English: Coot.
Japanese: O-ban (large water-hen.)

Specimen records:

Hamgyong Pukto — 15, 20 Sept. 1929 (Yam).
Hamgyong Namdo — Oct. (Kur); 3 Nov. 1913 (SSC).
Pyongan Namdo — 29 Apr. 1917 (Kur); 17 Oct. 1934 (Won).
Kangwon Do — 29 Sept. 1914 (LiWM).
Kyonggi Do — Oct. 1909, June 1910, 26 Oct. 1912 (LiWM); undated, 1920 (SoM); 23 Nov. 1926, 23 Apr. 1930 (Taka).

The coot is a not uncommon summer resident. The lack of records from the southern provinces suggests it enters the peninsula from the mainland and migrates back the same way. Y. Kuroda and Miyakoda (1919, 148) give its Seoul residence as from early June to early October, adding "it nests in the marshes and sings in August in the paddies." Yoshida (1923, 315) observed it in Hwanghae Do and Pyongan Pukto from 11 to 21 July. The 1942 Hand-List gives it as breeding, but there is no concrete proof, other than the collecting dates.

OTIDAE

114. Otis tarda dybowskii Taczanowski

Otis Dybowskii Taczanowski, Journ. f. Orn., **22**, 1874, p. 331. (Dauria.)
English: Siberian Bustard.
Japanese: No-gan (field, or upland goose.)

Specimen records:

Hamgyong Namdo — 27 Feb. 1887 (Tacz).
Pyongan Pukto — 1 Apr. 1921 (Kur).
Pyongan Namdo — Mar. 1909 (2) (LiWM); 12 Jan. 1939 (Won).
Hwanghae Do — Jan. (Kur); 29 Dec. 1916 (SSC); 12 Jan., 20 Mar. 1927 (Taka).

Kangwon Do	— 20 Dec. 1926 (Taka).
Kyonggi Do	— 13 Jan. 1889 (Camp); Feb. 1910 (LiWM); 10 May 1928 (SSC); 9 Jan. 1928 (Taka); 1929 (SoM).
Chungchong Pukto	— 13 Dec. 1911 (LiWM); 2 Jan. 1928 (2) (Kur).
Kyongsang Namdo	— 16, 24 Dec. 1883, 6, 10 Jan. 1884 (USNM); Jan. 1922 (Kur).

The Bustard was formerly a common, but is now a rare winter visitor. Taczanowski (1888, 456) found it "common all winter from Seoul to the Manchurian border; around the capitol one can sometimes see bands of up to a hundred individuals; south of Seoul it is rare; in summer one never sees it." Campbell (1892, 246) adds "I have shot numbers of this bird during the winters of 1887, 1888 and 1889. In 1887 it was much more plentiful, probably because the winter was severe . . . flocks of thirty or forty were quite common. Its arrival in Seoul varied, according to the severity or mildness of the season, from October to December, and I have seen it in the open fields between Chemulpo and Seoul as late as the end of March . . . [it] is extremely timid and difficult to approach." Jouy took a good series near Fusan.

The bird has become increasingly scarcer since the start of the Japanese tenure. Won (1934, 116) considers it rare. I never heard of it being seen by either Americans or Koreans during the winter I spent there.

ROSTRATULIDAE

115. Rostratula benghalensis benghalensis (Linné)

Rallus benghalensis Linné, Syst. Nat., ed. 10, **1**, 1758, p. 153. (Asia.)

English: Painted Snipe.
Japanese: Tama shigi (ball snipe.)

The only record for this straggler in Korea is that of Taczanowski's (1888, 458), "a female beginning to change plumage was killed near Seoul 6 September [1887?], and is the only example; found in a rice paddy."

HAEMATOPODIDAE

116. Haematopus ostralegus osculans Swinhoe

Haematopus osculans Swinhoe, Proc. Zool. Soc. London, 1871, p. 405. (north China.)

English: Eastern Oystercatcher.
Japanese: Miyakodori (metropolis bird.)

Specimen records:

Hamgyong Namdo — 18 Apr. 1912, 1 July 1917 (Taka).
Pyongan Pukto — 5, 12 June 1917 (4) (LiWM); 1 July 1917, 18 Mar. 1927 (4) (Taka); 23 Apr. 1929 (Yam).
Pyongan Namdo — June 1917 (2) (Taka).
Hwanghae Do — Mar. 1912 (Kur); 13 June 1917 (SSC).
Kyonggi Do — 6 Sept. 1883 (USNM); June 1910, 25 Mar. 1911 (LiWM).
Cholla Namdo — 24 Mar. 1910 (LiWM); 13 Apr. 1917, Dec. 1927 (Kur); 20, 21 Dec. 1926 (Taka); 7, 15 Feb. 1930 (Yam).
Kyongsang Namdo — 8 Nov. 1885 (USNM).

The Oystercatcher is a not uncommon summer resident along the west coast of Korea. A few winter at the southern tip in Cholla Namdo, Taczanowski (1888, 459) says "rare in spring near Seoul." Campbell (1892, 246) on the contrary called it "plentiful in spring and summer along the Han River." Kuroda found it breeding 13 April 1917 at the mouth of the Yezanko River near Moppo where "two eggs of this bird were collected by me on the gravelly ground of a small and low delta . . ." (1918, 513). Won (1934, 114) says it is uncommon, but breeds on islands off Pyongan Namdo.

I first saw a pair feeding on the tide flats near Suwon 12 March 1946. They were very wild, and I was never able to get within shot-gun range of them, though I observed them in the same locality repeatedly during the next six weeks.

CHARADRIIDAE

117. Vanellus vanellus (Linné)

Tringa Vanellus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 148. (Sweden.)
English: Lapwing.
Japanese: Tageri (paddy lapwing.)

Specimen records:

Hamgyong Pukto — 13 Oct., 1 Nov. 1929 (Yam).
Pyongan Namdo — 23 Mar., 12 Apr. 1932, 30 Apr. 1934 (Won).
Kyonggi Do — Nov. 1911, 25 Oct. 1912 (LiWM); Apr. (Kur); 10 Jan. 1927 (SSC); 5 Jan. 1926, 5 Jan., 16 Oct. 1927 (Taka); 24 Oct. 1930 (SoM); 15 Nov. 1928, 31 Oct. 1930 (Won).
Chungchong Namdo — 29 Dec. 1911 (LiWM); 21 Dec. 1926 (Taka).
Kyongsang Namdo — 24 Dec. 1914 (3) (LiWM).

The Lapwing is an uncommon spring and autumn transient in Korea. Taczanowski (1887) reports a March specimen from 'Dultoni,' presumably in Kyonggi Do, and (1888, 468) calls it "rare during the two migration periods." Campbell says (1892, 246) "I have not found the Lapwing numerous in Korea." Won (1934, 114) on the other hand, calls it common.

118. Microsarcops cinerea (Blyth)

Plurianus cinereus Blyth, Journ. As. Soc. Bengal, **11**, 1842, p. 587. (Calcutta, India.)

English: Grey-headed Lapwing.
Japanese: Keri (autochthonous.)

Specimen records:

Kyonggi Do — 27 Sept. 1887 (Tacz); 17 Mar. 1889 (Camp); 22 May 1919 (SSC); 30 Apr., 23 Nov. 1914 (LiWM).
Kyongsang Namdo — 19 Apr. 1884 (USNM).

This species is a rare spring and autumn transient. Taczanowski (1888, 457) says "in summer a few, absent in winter." Y. Kuroda and Miyakoda (1919, 147) give its season near Seoul as late March and April, October and November. It is perhaps worth noting that there is no record of the species' occurrence in Korea since 1919.

119. Squatarola squatarola (Linné)

Tringa Squatarola Linné, Syst. Nat., ed. 10, **1**, 1758, p. 149. (Sweden.)

English: Grey Plover.
Japanese: Daizen (autochthonous; also means a large serving tray.)

Specimen records:

Hamgyong Pukto — 26 Sept. 1917 (2) (LiWM); 17, 26 Sept. 1929 (Yam).
Hamgyong Namdo — 15 Aug. 1880 (G & S); Sept. (Kur).
Pyongan Pukto — 4 Sept. 1912 (SSC); 15, 29 Apr. 1929 (Yam).
Kyonggi Do — 27 Sept. 1887 (Tacz); 22 Oct. 1911, 17 Oct. 1912, 18 Oct. 1914 (LiWM); 19 Apr. 1917 (Kur); 15 Oct. 1923 (SoM); 24 May, 10 Oct. 1927 (Taka); 10 Oct. 1927, 20 Sept., 30 Oct. 1930 (Won).

The Grey Plover is a not uncommon migrant in spring and autumn. Taczanowski (1888, 456) writes "one sees a few during both migrations." Kobayashi (1931) gives an early arrival date of ten observed in Hwanghae Do, 19 March 1931. Won (1934, 113) calls it common.

120. Pluvialis dominica fulva (Gmelin)

Charadrius fulvus Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 687. (Tahiti.)

English: Eastern Golden Plover.
Japanese: Munaguro (black-breast.)

Specimen records:

Hamgyong Pukto — 19 Aug. (2), 27, 28 Sept. 1917 (LiWM); 17, 18 Sept. 1929 (Yam).
Hamgyong Namdo — 11 Sept. 1912 (SSC); Sept. (Kur).
Pyongan Pukto — 14 Apr. 1929 (Yam).
Kyonggi Do — 23 Sept. 1883 (USNM); 25 Sept. 1887 (Tacz); Oct. 1909 (LiWM); 10 Oct. 1924, 2 Oct. 1929 (SoM); 4 Oct., 9 Nov. 1927 (Taka); 5 May 1928, 18, 20 Sept. 1930 (Won); 27 Apr. 1946 (3) (MCZ).

The Golden Plover is a not uncommon spring and autumn transient. Taczanowski (1888, 456) calls it "quite common during migration," Kobayashi gives sight records of its arrival in Hwanghae Do on 23 March (1931) and 24 March (1932). Won (1934, 119) calls it uncommon. I encountered a flock of 36 Golden Plover on freshly-ploughed ground at the Suwon airport 27 April 1946, from which I collected the three listed above.

121. Charadrius dubius curonicus Gmelin

Charadrius curonicus Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 692. (Kurland, Baltic.)

English: Little Ringed Plover.
Japanese: Ko-chidori (little plover.)

Specimen records:

Hamgyong Pukto — 19, 25 Aug. 1917 (3) (LiWM).
Hamgyong Namdo — 25 July 1883 (USNM).
Pyongan Pukto — 12 June 1912 (AMNH); 6, 12 Apr. 1929 (Yam).
Pyongan Namdo — 18 May 1917 (2) (LiWM); 29 Apr. 1917 (2) (Kur); 25 Apr. 1931, 20 Apr. 1933 (Won).

Kangwon Do — 4 Apr. 1915 (SSC).
Kyonggi Do — 25 June, 18 Sept. 1883 (USNM); 25 Apr., May 1909 (LiWM); 17, 22 Apr. 1917 (Kur); 10 Apr., 27 Sept. 1929 (SoM); 3 Apr. (3), 24 Apr. 1927, 10 Apr. 1930 (2) (Taka); 9, 18 Sept. 1927, 28 Apr. 1928, 7, 9 July, 20 Aug. 1929 (Won); 7 Apr. 1946 (2) (MCZ).
Chungchong Namdo — 8, 9 Apr. 1917 (11) (Kur).
Kyongsang Namdo — 25 Dec. 1884 (USNM); 25 May 1927 (Won).

This species is a common summer resident, nesting along the rivers. Kuroda took an egg ready to be laid from a female he collected 29 April 1917 in Pyongan Namdo. Mori (1927, 388) published a photograph of a nest with three eggs on the Han River 4 June 1927.

I first noted them on a small stream through the rice paddies near Suwon 7 April 1946, and collected a courting pair, the female of which is a pure albino, a rarity among the Limicolae. From then until I left, the plaintive notes of this plover could always be heard at the head of the lake, where several pairs carried on their interminable, noisy courtship.

122. Charadrius alexandrinus dealbatus (Swinhoe)

Aegialites dealbatus Swinhoe, Proc. Zool. Soc. London, 1870, p. 138. (South coast of China, Formosa, Hainan.)

English: Kentish Plover.
Japanese: Shiro chidori (white plover.)

The 1942 Hand-List recognizes the longer-billed western race, *C. a. alexandrinus* Linné, as a rare visitor to Korea, on the basis of two specimens collected by Kuroda and so identified by him. They were taken in each case with shorter-billed *dealbatus* respectively in Kyonggi Do 19 April 1917 and in Pyongan Namdo 29 April 1917. Kuroda gives (1918, 512) their bill lengths as 16.5 and 18.5.

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (LiWM).
Pyongan Pukto — 23 July 1927 (Taka).
Pyongan Namdo — 18 May 1917 (2) (LiWM); 29 Apr. 1917 (Kur); 21 June 1931 (Won).
Kangwon Do — 29 Mar. (3), 24 Sept. 1914 (LiWM).
Kyonggi Do — 1, 5 May 1909, 30 June 1913, 7 July 1915 (3) (LiWM); 12 Apr. 1912 (SSC); 19 Apr. 1917 (Kur).
Cholla Namdo — 7 Jan. 1927 (5) (Taka).

The Kentish Plover is a not uncommon spring and autumn transient in Korea. A few may winter in the extreme southern portions. There are no other references to the species in literature for the area, and I did not encounter it.

123. Charadrius placidus Gray and Gray

Charadrius placidus J. E. and G. R. Gray, Cat. Mamm. Bds. etc. Nepal and Tibet in Brit. Mus., ed. 2, 1863, p. 70. (Nepal.)

English: Long-billed Ringed Plover.

Japanese: Ikaru chidori (grosbeak plover.)

Specimen records:

Hamgyong Pukto	— 7, 20 Sept. 1917 (LiWM).
Pyongan Namdo	— 22 Apr. 1931, 4 Aug. 1932, 24 Jan. 1936 (Won).
Hwanghae Do	— 18 Mar. 1914 (3) (LiWM).
Kangwon Do	— 30 Nov., 4 Dec. 1929 (Yam).
Kyonggi Do	— 7 Oct. 1883 (USNM); Jan. 1887 (Tacz); 5 Mar. 1911 (LiWM); 10, 15, 21 Sept. 1927, 20 Mar. 1930 (Taka); 6 Sept. 1927 (Won); 2, 17 Oct. 1929 (SoM).
Chungchong Namdo	— 8 Apr. 1917 (2) (Kur).
Kyongsang Namdo	— 17 Mar. 1916 (SSC).

This species seems to be a not uncommon spring and autumn transient. Taczanowski (1888, 468) says it is "common in autumn and spring, rare in winter, absent in summer." Kuroda, however, in commenting on the two he collected in Chungchong Namdo (1917, suppl.) says "I think this bird breeds here, but they were rare," a comment he omits from his 1918 English edition. Won (1934, 113) says it is common and breeds. Other authorities, including Peters and the 1942 Hand-List regard it as breeding in Korea, but there is no evidence beyond Won's single summer collecting record to indicate even its presence there during the breeding season.

124. Charadrius mongolus stegmanni Stresemann

Charadrius mongolus stegmanni Stresemann, Orn. Monatsb., **48**, 1940, p. 55. (*Nom. nov.* for *C. m. litoralis* Stegmann, preocc. Behring Island.)

English: Mongolian Plover.

Japanese: Medai-chidori (large eye plover.)

The 1942 Hand-List includes *C. m. mongolus* in the Korean list on the authority of Stegmann (Orn. Monatsb., 1937, 26) who says both races occur in Ussuri and Korea on migration. However, the Japanese assign all the specimens they have examined to the northeastern Siberian race, *stegmanni*.

Specimen records:

Hamgyong Pukto — 26 Sept. 1917 (2) (LiWM); 17, 19 Sept. 1929 (Yam).
Pyongan Pukto — 8 May 1929 (Yam).
Pyongan Namdo — 18, 20 May 1917 (LiWM); 17 May 1917 (SSC).
Kangwon Do — 25 Sept., 5 Oct. 1914 (5) (LiWM).
Kyonggi Do — 2 June 1887 (2) (Tacz); 22 Oct. 1911 (LiWM); Apr. (Kur); 19 Oct. 1927, 2, 15 Oct. 1929, 26 Aug. 1930 (Won).

The Mongolian Plover is a common spring and autumn transient. Taczanowski (1888, 456) says it is "rare in spring," but Won (1934, 113) finds it common, as the specimen record indicates. The species had not appeared before my departure in early May.

[*Charadrius leschenaultii* Lesson
English: Geoffroy's Sand Plover.
Japanese: O-medai chidori (large Mongolian plover).

This species has appeared on all lists of Korean birds ever since it first was included in Iizuka's 1914 Hand-List. Kuroda (1917, 26) mentions a record for the "Han River, April," the source of which I have been unable to find. There is not a Korean specimen traceable in any collection today, or in any of the literature. The species is not known to breed east of western Mongolia, and is only a straggler to Japan.]

125. Eupoda asiatica vereda (Gould)

Charadrius veredus Gould, Proc. Zool. Soc. London, 1848, p. 38. (Northern Australia.)

English: Eastern Dotterel.
Japanese: O-chidori (large plover.)

The Dotterel is a straggler to Korea, the only record being one purchased by Kuroda (1913, 419) in a Seoul "stuffing shop" which was purportedly taken in Korea in December 1911.

SCOLOPACIDAE

126. Numenius minutus Gould

Numenius minutus Gould, Proc. Zool. Soc. London, 1840 (1841), p. 176. (New South Wales.)

English: Least Whimbrel.
Japanese: Ko shakushigi (little curlew.)

Specimen records:

Pyongan Pukto — 29, 30 May 1929 (Yam).
Hwanghae Do — 26 Apr. 1917 (SSC).
Kyonggi Do — 28 Mar., 5 May 1928 (Won); 24 Apr. 1928 (SoM).

From the specimen record, the Least Whimbrel is a rare spring transient in Korea.

127. Numenius phaeopus variegatus (Scopoli)

Tantalus variegatus Scopoli, Del. Flor. et Faun. Insubr., fasc. 2, 1786, p. 92. (No type locality = Luzon, *ex* Sonnerat.)

English: Eastern Whimbrel.
Japanese: Chu shakushigi (middle-sized curlew.)

Specimen records:

Hamgyong Pukto — Sept. (Kur).
Pyongan Pukto — 3 May 1917 (Kur); 14 Apr., 2 May 1929 (Yam).
Pyongan Namdo — 13 May 1917 (LiWM).
Hwanghae Do — 29 Apr. 1917 (SSC); 1 May 1918 (Taka); 5–10 May 1935 (7) (Won).
Kyonggi Do — 3 May 1887 (Tacz); June 1909, Apr. 1915 (LiWM); 4 May 1928 (SoM); 15 Apr. 1927 (4) (Taka); 5, 10 May 1928, 20 Oct. 1930 (Won).

The Whimbrel is a not uncommon transient, seemingly more abundant in spring than in autumn. Taczanowski (1888, 465) found it "common in spring migration on the coast, and sometimes inland." Kobayashi (1933) observed the arrival of a flock of about one hundred in Hwanghae Do, 23 March 1932. Won (1934, 111) calls it common.

128. Numenius arquata orientalis C. L. Brehm

Numenius orientalis C. L. Brehm, Handb. Naturg. Vög. Deutschl., 1831, p. 610. (East Indies.)

English: Indian Curlew.
Japanese: Dai shakushigi (large curlew.)

Specimen records:

Hamgyong Pukto — Sept. (Kur).
Hamgyong Namdo — Mar. 1910 (Taka).
Pyongan Pukto — 3 May 1917 (Kur).
Pyongan Namdo — 1 Oct. 1915 (SSC); 24 Oct. 1931 (Won).
Kyonggi Do — 4 Sept. 1883 (USNM); Sept. 1909 (LiWM); undated (Kur); 21 Jan. 1928 (Taka); 15 Oct. 1929 (SoM); 8 Oct. 1930 (Won).
Cholla Namdo — 17 Jan., 14 Feb. 1930 (Yam).
Kyongsang Namdo — 2 Nov. 1884 (USNM).

The Indian Curlew is a not uncommon transient, not as common as the Australian Curlew, but more plentiful, especially in autumn, than the Whimbrel. Kobayashi (1932) gives its arrival dates in Hwanghae Do as 23 March 1931 and 25 March 1932, but his identification is to be questioned, as possibly referable to the next species. Won (1934, 111) calls it common.

129. Numenius madagascariensis (Linné)

Scolopax madagascariensis Linné, Syst. Nat., ed. 12, **1**, 1766, p. 242. (Madagascar, error = Macassar, Celebes.)

English: Australian Curlew.
Japanese: Horoku shigi (clay pan snipe.)

Specimen records:

Hamgyong Namdo — 17 Aug. 1880 (G & S); Nov. 1911 (Taka); 26 Apr. 1917 (Kur).
Pyongan Pukto — 14, 19 May 1929 (Yam).
Pyongan Namdo — 24 Oct. 1931 (Won).
Hwanghae Do — Nov. 1911 (Uch); Nov. 1911 (2) (Kur).
Kyonggi Do — 8, 11 Sept. 1883 (USNM); Sept. 1909, Apr., 18 Oct. 1914 (3), 15 Oct. 1915 (LiWM); 16 Oct. 1929 (SoM); 25 Sept. 1930 (SSC).
Kyongsang Namdo — 6 Apr. 1917 (Kur).

This is the commonest of the curlews in Korea, a fairly common spring and autumn transient. Taczanowski (1888, 459) "met with in all seasons, rare in winter." Kuroda (1918, 513) says "This curlew is not uncommon in Corea on its spring and autumn migrations; it is there more common than the preceding form [*arquata*], as in Japan." Kobayashi (1932) notes its arrival in Hwanghae Do 24 March.

I first encountered the species near Suwon 10 March 1948, and saw from two to five of them every time I visited the marshes at the head of the inlet through March. This was the only species of curlew I encountered, and none I saw ever came within gunshot. I could never make out a light rump on any I observed.

130. Limosa limosa melanuroides Gould

Limosa Melanuroides Gould, Proc. Zool. Soc. London, 1846, p. 84. (Port Essington, Australia.)

English: Eastern Black-tailed Godwit.
Japanese: Oguro shigi (black-tailed snipe.)

Specimen records:

Hamgyong Pukto — 29 Aug. 1917 (LiWM); 13 Sept. 1929 (Yam).
Hwanghae Do — 1 May 1918 (Taka).
Kyonggi Do — 6 Sept. 1889 (Camp); 15 Oct. 1917 (LiWM); 15 May 1919 (SSC); 18, 20 Oct. 1927 (Taka); Dec. 1925, 25 Sept. 1931 (SoM); 3 Oct. 1927, 25 Nov. 1930 (Won).

The Black-tailed Godwit is an uncommon, irregular transient in Korea.

131. Limosa lapponica (Linné)

Limosa lapponica var. *Novae-zealandiae* Gray, Voy. Erebus & Terror, 1846, p. 13. (New Zealand.)

Limosa lapponica menzbieri Portenko, Auk, **53**, 1936, p. 195. (Indigirka delta.)

English: Eastern Bar-tailed Godwit.
Japanese: O-sorihashi shigi (large bent-billed snipe.)

Perhaps some of the older specimens which have not been examined recently are referable to *L. l. menzbieri*, which, according to its known distribution elsewhere should occur more frequently in Korea, but Yamashina's series are the only ones that have been definitely so identified.

Specimen records:

Limosa lapponica menzbieri:
Hamgyong Pukto — 17 Sept. 1929 (5) (Yam).
Limosa lapponica novae-zealandiae:
Hamgyong Pukto — Sept. (Kur).
Hamgyong Namdo — 3, 11 Sept. 1912 (SSC).
Hwanghae Do — Nov. 1911 (Uch).
Kangwon Do — 5 Apr. 1914 (2) (LiWM).
Kyonggi Do — 6 Sept. 1883 (3) (USNM); 22 Oct. 1887 (Tacz); Oct., Nov. 1909 (LiWM); 15 Apr. 1927 (3) (Taka); Oct. 1927 (SoM).
Cholla Namdo — 13 Apr. 1917 (Kur).
Kyongsang Namdo — 25 Oct., 8 Nov. 1885 (USNM).

The Bar-tailed Godwit is a not uncommon transient. The only reference to it in literature beyond the specimen records for Korea is Taczanowski's (1888, 457) statement, "quite rare in autumn in the rice paddies."

132. Tringa erythropus (Pallas)

Scolopax erythropus Pallas, in Vroeg's Cat., 1764, Adumbr., p. 6. (Holland.)
English: Spotted or Dusky Redshank.
Japanese: Tsuru shigi (crane snipe.)

Specimen records:

Hamgyong Pukto — 10 Sept. 1917 (3) (LiWM); 29 Sept., 18 Oct. 1929 (Yam).
Pyongan Pukto — 11 Apr. 1929 (Yam).
Pyongan Namdo — 30 Apr. 1917 (3) (Kur).
Hwanghae Do — 21 Mar. 1913 (SSC).
Kyonggi Do — 11 Mar. 1889 (Camp); Apr., 30 Oct. 1910, 2 Apr. 1911, 20 Mar. 1912, 20 May 1914 (LiWM); 15 Mar. 1928, 7 Apr. 1930 (Won); 24 Mar. (5), 1 May 1946 (MCZ).
Kyongsang Pukto — Mar. (Kur); Oct. 1927 (SoM).

The Dusky Redshank is a common spring and autumn transient. Kuroda (1918, 514) speaks of "a flock of some twenty or thirty birds in a group . . . all in the dark summer dress" in a paddy in Pyongan Namdo 30 April. I encountered the first forerunners of the spring flight, small numbers all in light plumage, in the paddies near Suwon 15 March 1946. Ten days later their numbers started to increase, and throughout April flocks of several hundred individuals were not uncommon. No dark plumaged birds appeared until the end of April,

but the flocks of early May were composed two-thirds of black-bellied adults.

133. Tringa totanus eurhinus (Oberholser)

Totanus totanus eurhinus Oberholser, Proc. U. S. Nat. Mus., **22**, 1900, p. 207. (Tso Moriri Lake, Ladak.)

English: Eastern Redshank.
Japanese: Aka ashi shigi (red legged snipe.)

Specimen records:

Hamgyong Pukto — 17, 19 Sept. 1929 (Yam).
Hwanghae Do — Apr. 1933 (SoM).
Kyonggi Do — 19 Sept. 1887 (Tacz); 24 Sept. 1930 (Won); 29 Mar. 1934 (SoM).
Kyongsang Pukto — 15 Mar. 1916 (SSC).

The Redshank is an uncommon, irregular transient in Korea, evidently straggling in occasionally from the westward during migrations.

134. Tringa stagnatilis (Bechstein)

Totanus stagnatilis Bechstein, Orn. Taschenb. Deutschl., 1803, p. 292, pl. 29. (Germany.)

English: Marsh Sandpiper.
Japanese: Ko ao ashi shigi (small green legged snipe.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (LiWM).
Kyonggi Do — 5 Oct. 1923 (Kur).

The Marsh Sandpiper is a straggler in Korea, known there only from the above two records.

135. Tringa nebularia (Gunnerus)

Scolopax nebularia Gunnerus, in Leem, Beskr. Finm. Lapper., 1767, p. 251. (District of Trondhjem, Norway.)

English: Greenshank.
Japanese: Ao ashi shigi (green legged snipe.)

Specimen records:

Hamgyong Pukto — 19 Aug.-7 Sept. 1917 (5) (LiWM); 26, 27 Sept. 1917 (Taka); 29 Aug. 1920 (SSC); 16 Sept., 9 Oct. 1929 (Yam).
Pyongan Pukto — 2, 14 May 1929 (Yam).
Kyonggi Do — 6, 20 Sept. 1883 (USNM); 3 May 1887 (Tacz); 25 Apr. 1917 (2) (Kur); Nov. 1909 (2), 18 Oct. 1914 (3) (LiWM); 12 Apr. (3), 9 Sept. (2) 1927 (Taka); 14 Oct. 1929 (3) (SoM); 19 Sept., 23 Oct. 1928, 11 Oct., 25 Nov. 1930 (Won); 1 May 1946 (MCZ).

The Greenshank is a common transient in the northern half of Korea, more plentiful in autumn than in spring. The absence of records south of Kyonggi Do is indicative of the continental nature of its migration route. Taczanowski (1888, 459) says "common . . . during the autumn flight, rare in spring in the rice fields." Campbell (1892, 246) lists it as collected, giving no data save "extremely common in the rice fields in spring and autumn." Won (1934, 110) considers it uncommon. The only ones I saw were three in a flooded paddy near Suwon on 1 May 1946, my last day afield, of which I collected one.

136. Tringa ocrophus Linné

Tringa Ocrophus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 149. (Sweden.)
English: Green Sandpiper.
Japanese: Kusa shigi (Grass snipe.)

Specimen records:

Hamgyong Pukto — 6 Sept. 1917 (LiWM); 1 Oct. 1929 (Yam).
Pyongan Namdo — Sept. (Kur).
Hwanghae Do — 10 May 1917 (SSC).
Kangwon Do — 8 Sept. 1914 (LiWM).
Kyonggi Do — 7 Oct. 1883 (2) (USNM); Sept., Oct. 1887 (3) (Tacz); 19 Apr. 1911, 31 Oct. 1914 (LiWM); 30 Apr. (2), 26 Sept. (2), 5 Oct. 1927 (Taka); 30 Sept. 1922, 20 Apr. 1929 (SoM); 16, 30 May, 17 Sept., 9 Oct. 1929 (Won); 17 Apr. 1946 (2) (MCZ).
Cholla Namdo — 27 Dec. 1929 (Yam).

The Green Sandpiper is a common spring and autumn transient, found usually in small flocks in the wetter paddies, where it is fond of working along the narrow separating dykes. I found it common in the paddies near the Kings' Forest throughout the latter half of April.

137. Tringa glareola Linné

Tringa Glareola Linné, Syst. Nat., ed. 10, **1**, 1758, p. 149. (Sweden.)
English: Wood Sandpiper.
Japanese: Takabu shigi (hawk-patterned snipe.)

Specimen records:

Hamgyong Pukto — 17 Aug.-7 Sept. 1917 (7) (LiWM); 28 Sept. 1917 (Taka); 9 Oct. 1929 (Yam).
Hamgyong Namdo—12 Sept. 1920 (SSC).
Pyongan Pukto — 26 May 1917 (LiWM); 24 Apr., 10 May 1929 (Yam).
Pyongan Namdo — 13 May 1917 (2) (LiWM); 25 May 1935 (Won).
Hwanghae Do — 3 May (Kur).
Kangwon Do — 29 Sept. 1914 (LiWM).
Kyonggi Do — Sept., Oct. 1897 (2) (Tacz); May 1909, 17 Oct. 1914 (LiWM); 28 Apr. (3), 2, 9 Sept. 1927, 16 May 1928 (2) (Taka); 4 May 1928 (SoM); 15, 19, 22 May 1928 (Won); 25 Apr., 1 May 1946 (MCZ).

This species is a common spring and autumn transient, found in small flocks in the flooded paddies. The absence of records from southern Korea is suggestive of a flight route across the China Sea from the latitude of Kyonggi Do. The spring flight seems to extend from mid-April through May. I saw the first arrivals in the Suwon area 20 April 1946.

138. Pseudototanus guttifer (Nordmann)

Totanus guttifer Nordmann, in Erman's Reise, Naturh. Atlas, 1835, p. 17. (Okhotsk.)
English: Nordmann's Greenshank.
Japanese: Karafuto aoashi shigi (Sakhalin green legged snipe.)

Nordmann's Greenshank is a straggler in Korea, known from one single record, a specimen in the Seoul School collection taken at Sinpo, Hamgyong Namdo, 13 September 1912.

139. Xenus cinereus (Güldenstaedt)

Scolopax cinerea Güldenstaedt, Novi Comm. Sci. Petropol., **19**, 1774, p. 473, pl. 19. (Caspian Sea, Terek River.)
English: Terek Sandpiper.
Japanese: Sorihashi shigi (bent billed snipe.)

Specimen records:

Hamgyong Pukto — 29 Aug. 1912 (SSC); 19 Aug. 1917 (LiWM).
Pyongan Namdo — Sept. (Kur).
Kyonggi Do — 18 Oct. 1914 (LiWM); Oct. 1927, 2 Oct. 1929 (SoM); 20 Sept., 12 Oct. 1929, 25 Sept., 10, 11 Oct. 1930 (Won).
Cholla Namdo — 13 Apr. 1917 (Kur).
Kyongsang Pukto — 11 Aug. 1880 (G & S).

The Terek Sandpiper is an uncommon transient. Won (1934, 111) says "a few pass through on the coast in spring and autumn." Kuroda (1918, 514) saw two, of which he collected one, at the mouth of the Yezanko River in Cholla Namdo, 13 April 1917, and comments "This species is a rare bird in Corea, as in Japan."

140. Actitis hypoleucos (Linné)

Tringa hypoleucos Linné, Syst. Nat., ed. 10, **1**, 1758, p. 149. (Sweden.)
English: Common Sandpiper.
Japanese: Iso shigi (beach snipe.)

Specimen records:

Hamgyong Pukto — 17–29 Aug. 1917 (8) (LiWM); 19 Sept. 1929 (Yam).
Pyongan Pukto — 12 June 1912 (AMNH).
Pyongan Namdo — Aug. (Kur); 22 Apr. 1931 (Won).
Kangwon Do — 11 Apr., 17 Sept. 1914 (3) (LiWM).
Kyonggi Do — 4 Sept. 1883 (USNM); Sept. 1887 (2) (Tacz); 5 July 1913 (LiWM); 11 Sept. 1929 (SoM); 14 May 1928, 5, 9 Oct. 1929 (Won); 26 Apr. 1946 (2) (MCZ).
Kyongsang Pukto — 17 Feb. 1916 (SSC).

This species is a common spring and autumn transient. Won (1934 110) says "many come in spring and autumn to the streams or rivers." Taczanowski (1888, 457) was partly in error when he wrote "small numbers in summer; nests near Seoul, particularly common in autumn, absent in winter," for the bird has never been known to breed in Korea. When it comes through in spring, however, it occurs in small numbers, usually in pairs, whereas it has already gathered together in flocks before it arrives in autumn. I saw the first spring arrivals at Suwon 20 April 1946.

141. Heteroscelus incanus brevipes (Vieillot)

Totanus brevipes Vieillot, Nouv. Dict. Hist. Nat., **6**, 1816, p. 420. (Timor.)

English: Asiatic Wandering Tattler.

Japanese: Ki ashi shigi (yellow-legged snipe.)

Specimen records:

Hamgyong Pukto — 31 Aug. 1917 (LiWM); Sept. (Kur); 4 Oct. 1929 (Yam).
Hamgyong Namdo — 17 Aug. 1880 (G & S); 15 Sept. 1920 (SSC).
Kyonggi Do — 27 Sept. 1887 (Tacz).
Kyongsang Pukto — 11 Aug. 1880 (G & S).
Kyongsang Namdo — 9 May 1886 (USNM).

The Tattler is an uncommon transient on the east coast, and practically unknown elsewhere in Korea. Aside from Taczanowski, who (1888, 457) says "a few in autumn," no other collector has ever found it on the western side of Korea.

142. Arenaria interpres interpres (Linné)

Tringa interpres Linné, Syst. Nat., ed. 10, **1**, 1758, p. 148. (Sweden.)

English: Turnstone.

Japanese: Kyojo shigi (city girl snipe.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (LiWM); 19, 22 Sept. 1922 (Yam).
Hamgyong Namdo — Sept (Kur).
Kyonggi Do — undated (SSC).
Kyongsang Namdo — 2 Aug. 1927 (Won).

The Turnstone is a not uncommon transient, recorded only in its southward flight. Won (1934, 114) calls it common. The absence of spring records, and the paucity of autumn records as well, is doubtless due to the species' habit of staying on the outer beaches and offshore islands instead of coming into the paddies, where it could have been observed and collected more frequently.

143. Capella solitaria japonica (Bonaparte)

Spilura solitaria a *japonica* Bonaparte, Compt. Rend. Acad. Sci. Paris, **43**, 1856, p. 579. (Japan.)

English: Eastern Solitary Snipe.

Japanese: Ao shigi (green snipe.)

Specimen records:

Kyonggi Do — 25 Jan. 1911, 1 Dec. 1913, 15 Feb. 1914 (LiWM); 14 Jan. 1921 (SSC); 20 Jan. 1928 (Taka); 10 Jan. 1929 (Won).
Chungchong Pukto — Nov. 1927 (Kur).
Kyongsang Namdo — 18 Nov. 1884 (USNM).

The Solitary Snipe is a rare transient, occurring only in late autumn, winter, or early spring. Kuroda (1917, 33) says "they may be found at Kwangnung, Kyonggi Do". Won (1934, 11) adds "they frequent the streams in the valleys."

144. Capella stenura (Bonaparte)

Scolopax stenura "Kuhl" Bonaparte, Ann. Stor. Nat. Bologna, **4**, 1830, p. 335. (Sunda Islands.)

English: Pintail Snipe.
Japanese: Hario shigi (needle-tail snipe.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (LiWM); 6 Aug. 1929 (Yam).
Pyongan Pukto — 10, 11 May 1929 (Yam).
Pyongan Namdo — 22 Aug. 1933 (Won).
Hwanghae Do — 5 May 1917 (SSC).
Kyonggi Do — Aug., 8, 23 Sept. 1883 (USNM); Nov. 1887 (Tacz); Sept. 1909, 4 Oct. 1916 (LiWM); Apr. (Kur); 5 Apr. 1927 (2) (Taka); 4 May 1928 (Won).
Korea — June 1917 (Taka).

The Pintail Snipe is a fairly common transient in Korea. Taczanowski (1888, 468) says it is "almost as common [as the Common Snipe] in autumn in the rice fields." Won (1934, 112) writes "common, passes through earlier than the Common Snipe. Migrates from mid-August, and has passed Anjiu [Pyongan Namdo] by mid-September."

[*Capella hardwickii* (Gray)

English: Latham's Snipe.
Japanese: O-jishigi (large ground-snipe.)

Yamashina's holograph list of the birds in the former Taka-Tsukasa collection mentions two specimens of "O-jishigi" from Kyonggi Do taken 5 April 1927. This list was prepared by Taka-Tsukasa's assistant, and the identification of the specimens, which can no longer be checked, is not certain. They were

overlooked by both the 1932 and 1942 Hand-Lists. There are no other Korean records for this species, which breeds only in northern Honshu and Hokkaido.]

145. Capella megala (Swinhoe)

Gallinago megala Swinhoe, Ibis, 1861, p. 363. (Peking, China.)

English: Swinhoe's Snipe.

Japanese: Chu ji-shigi (middle-sized ground-snipe.)

Specimen records:

Hamgyong Namdo — 15 Aug. 1880 (G & S).
Kyonggi Do — 24 Aug. 1883 (USNM); 23 Apr. 1911 (LiWM); 1, 26 Sept., 7 Oct. 1927 (Taka); 13 Apr. 1934 (MCZ).

Swinhoe's Snipe is at best a rare transient in Korea. Were it not for its general distribution elsewhere nearby, it might be regarded as a straggler. In view of the specimen record, and the absence of any other comment in literature, Taczanowski's remark (1888, 459) that it is "rare in winter north of Wonsan" is difficult to interpret.

146. Capella gallinago gallinago (Linné)

Scolopax Gallinago Linné, Syst. Nat., ed. 10, **1**, 1758, p. 147. (Sweden.)

English: Common Snipe.

Japanese: Ta shigi (paddy snipe.)

Specimen records:

Hamgyong Pukto — 10-28 Sept. 1917 (6) (LiWM).
Pyongan Pukto — 12, 18 Apr. 1929 (Yam).
Pyongan Namdo — 13 May 1917 (2) (LiWM); 17 Apr. 1931 (Won).
Hwanghae Do — 15 Sept. 1932 (SSC).
Kangwon Do — 30 March, 24 Sept. 1914 (LiWM).
Kyonggi Do — 28 Sept. 1883, 9 May 1936 (USNM); Nov. 1887 (Tacz); Sept. 1909 (LiWM); 14 Mar., 6 Apr. (5), 25 Sept.-10 Oct. (5) 1927 (Taka); 1, 22 May 1928 (SoM); 5, 12 May 1928, 5, 29 Apr. 1929 (Won); 28 Oct. 1929 (SSC); 13 Apr. 1934 (AMNH).
Chungchong Namdo — 8 Apr. 1917 (Kur).
Cholla Namdo — 23 Apr. 1931 (Uch).

This Snipe is a common transient. Taczanowski (1888, 468) comments "very common in autumn in the rice fields, rare in spring, ab-

sent in summer and winter." Campbell (1892, 246) notes it to be "always much more plentiful on the east coast of Corea than on the west. In this my own observation is corroborated by the opinion of other European sportsmen." Won (1934, 111) calls it "abundant" and (1932, 242) records a "not-unusual" hunter's bag of 55 "Ta shigi" shot 15 October 1931. I encountered only one during my spring in Korea, a single bird which I flushed several times out of a swamp in the Kings' Forest near Suwon 8 April 1946.

147. Scolopax rusticola rusticola Linné

Scolopax rusticola Linné, Syst. Nat., ed. 10, **1**, 1758, p. 146. (Sweden.)

English: Woodcock.
Japanese: Yama shigi (mountain snipe.)

Specimen records:

Pyongan Pukto	— 9 Apr. 1929 (Yam).
Kangwon Do	— Apr. (Kur).
Kyonggi Do	— Apr. 1914 (LiWM); Dec. 1925 (Won); 9 Dec. 1945 (MCZ).
Chungchong Namdo	— 9 Dec. 1914 (SSC).
Cholla Namdo	— 26 Oct. 1928 (Uch).

The Woodcock is an uncommon early spring and late autumn transient. Taczanowski (1888, 459) notes "a single one met with in autumn." Won (1934, 111) says it is "rare, lives in the grass in the mountain forests." The single bird I collected 9 December 1945 I flushed from a small wooded brook at the edge of cultivated land in the hills of southern Kyonggi Do.

148. Lymnocryptes minima (Brünnich)

Scolopax minima Brünnich, Orn. Boreal., 1764, p. 49. (Christiansö.)

English: Jack Snipe.
Japanese: Ko-shigi (little snipe.)

The Jacksnipe is a straggler to Korea, known there only from the single female specimen in the LiWong Museum, collected in Kyonggi Do 15 October 1916.

149. Calidris canutus rogersi (Mathews)

Canutus canutus rogersi Mathews, Bds. Austr., **3**, 1913, pp. 270, 273, pl. 163. (Shanghai, China.)

English: Eastern Knot.
Japanese: Ko obashigi (small tail-feather snipe.)

Specimen records:

Hamgyong Pukto — 3 Sept. 1912 (SSC).
Hwanghae Do — 1 May 1917 (SSC).
Kangwon Do — 30 Sept. 1914 (LiWM).
Cholla Namdo — 11 May 1931, 16 Aug. 1933 (Ueh).

The Knot is a rare transient visitor, though perhaps more plentiful on the unexplored outer beaches than the record indicates.

150. Calidris tenuirostris (Horsfield)

Totanus tenuirostris Horsfield, Trans. Linn. Soc. London, **13**, pt. 1, 1821, p. 192. (Java.)

English: Great Knot.
Japanese: Oba shigi (tail-feather snipe.)

Specimen records:

Hamgyong Pukto — 25 Aug. 1917 (LiWM); 19, 23 Sept. 1929 (Yam).
Hwanghae Do — 3 May (Kur); 1912 (SSC).

This species, like the preceding, is a rare transient visitor.

151. Crocethia alba (Pallas)

Trynga alba Pallas, in Vroeg's Cat., 1764, Adumbr., p. 7. (North Sea.)

English: Sanderling.
Japanese: Miyubi shigi (three-toed snipe.)

Specimen records:

Hamgyong Pukto — 13 Sept. 1929 (Yam).
Kangwon Do — 24–30 Sept. 1914 (7) (LiWM).

The Sanderling is an uncommon transient in Korea, known from the east coast only, where it should be more plentiful than the scant records suggest.

152. Eurynorhynchus pygmeus (Linné)

Platalea pygmea Linné, Syst. Nat., ed. 10, **1**, 1758, p. 140. (eastern Asia.)
English: Spoon-billed Sandpiper.
Japanese: Hera shigi (spatula snipe.)

Specimen records:

Hamgyong Namdo — 10 Sept. 1921 (Kur).
Kangwon Do — 24, 25 Sept. 1914 (LiWM); 21 Mar. 1916 (SSC).
Kyonggi Do — 7 Oct. 1917 (2) (Kur); 3 Feb. 1918 (Taka).
Cholla Pukto — 2 Oct. 1917 (3) (Kur).
Cholla Namdo — Mar. 1934 (4) (Kur).

The Spoon-billed Sandpiper is an uncommon transient in Korea.

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153. Erolia ruficollis (Pallas)

Trynga ruficollis Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 700. (southern Transbaikalia.)
English: Little Stint.
Japanese: Tonen (autochthonous, but also means "this year.")

Specimen records:

Hamgyong Pukto — 20 Aug. 1912 (SSC); 19–25 Aug. 1917 (5) (LiWM); Sept. (Kur).
Pyongan Pukto — 25 Apr., 13 May 1929 (Yam).
Pyongan Namdo — 13 May 1917 (3) (LiWM); 13 May 1919 (Taka).
Kangwon Do — 17–25 Sept. 1914 (6) (LiWM).
Kyonggi Do — Nov. 1887 (4) (Tacz); 11 May, Sept. 1909 (LiWM); 19 Apr. 1917 (Kur); 7, 18 Sept. 1927 (Taka); 18 Sept. 1927 (SoM); 9 Oct. 1930 (Won).

From the specimen record, the Little Stint is a not uncommon transient. Won (1934, 111) however, calls it rare.

154. Erolia minutilla subminuta (Middendorff)

Tringa subminuta Middendorff, Reise Nord. und Ost. Siberien, **1**, Th. 2, 1853, p. 222, pl. 19, f. 6. (Stanavoi Mountains.)
English: Long-toed Stint.
Japanese: Hibari shigi (lark snipe.)

Specimen records:

Hamgyong Pukto — 19–31 Aug. 1917 (5) (LiWM); Sept. (Kur).
Pyongan Pukto — 9, 19 May 1929 (Yam).
Kyonggi Do — Sept. 1887 (Tacz); 10 Sept. 1919 (SSC); 10 May 1928, 16 Oct. 1929 (SoM); 12, 28 May 1928 (Won).

The Long-toed Stint is probably a not uncommon transient. Taczanowski (1888, 457) calls it "quite common during both migrations," and Won (1934, 111) considers it common.

155. Erolia melanotos (Vieillot)

Tringa melanotos Vieillot, Nouv. Dict. Hist. Nat., **34**, 1819, p. 462. (Paraguay.)

English: Pectoral Sandpiper.
Japanese: America uzura shigi (American quail snipe.)

This Nearctic species is a straggler to Korea. Orii collected three in Hamgyong Pukto between 19 and 25 September 1929 "on migration with Siberian Pectoral Sandpipers," which Yamashina (1932, 249) identified.

156. Erolia acuminata (Horsfield)

Totanus acuminatus Horsfield, Trans. Linn. Soc. London, **13**, pt. 2, 1821, p. 192. (Java.)

English: Siberian Pectoral Sandpiper.
Japanese: Uzura shigi (quail snipe.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (2) (LiWM).
Hamgyong Namdo — 12 Sept. 1920 (SSC).
Pyongan Pukto — 19, 25 May 1929 (Yam).
Pyongan Namdo — 13 May 1917 (LiWM).
Kyonggi Do — May 1887 (Tacz); 11 May 1909, 21 May 1914 (LiWM); 18–24 Apr. 1927 (6) (Taka); 10 May 1928 (SoM);20 Sept. 1930 (Won).

This species is probably a not uncommon transient. Taczanowski (1888, 457) says "two males killed at Inchon in May; they were the only ones encountered in the country." Won (1934, 111) calls it common.

157. Erolia alpina sakhalina (Vieillot)

Scolopax sakhalina Vieillot, Nouv. Dict. Hist. Nat., **3**, 1816, p. 359. (Russia = Island of Sakhalin.)

English: Eastern Dunlin.
Japanese: Hama shigi (sea-shore snipe.)

Specimen records:

Hamgyong Pukto — 19, 25 Aug. 1917 (LiWM); 16, 19 Sept. 1929 (Yam).
Hamgyong Namdo — Sept. 1920 (SSC).
Pyongan Pukto — 3 May 1917 (Kur); 25 Apr. 1929 (Yam).
Pyongan Namdo — 13 May 1917 (3) (LiWM); 13 May 1917 (Taka); 22 Oct. 1932 (Won).
Kangwon Do — 29 Oct. 1911, 29 Mar., 28, 30 Sept. 1914 (7) (LiWM).
Kyonggi Do — 28 May, 7 Oct. (3) 1883 (USNM); Nov. 1887 (Tacz); Nov. 1909 (2), 17 Oct. 1911 (3), 18 Oct. 1914 (LiWM); 24, 25 Apr., 10 Oct., 8 Nov. 1927 (Taka); 10 Nov. 1928, 16 Oct. 1929; 25 Sept., 10 Oct. 1930 (Won); 14 Oct. 1929 (3), Nov. 1930 (SoM).
Cholla Namdo — 11–13 Apr. 1917 (10) (Kur); 3 Jan. 1930 (Yam).
Kyongsang Namdo — 26 Oct. 1884 (USNM).

The Dunlin is a common spring and autumn transient, perhaps the most abundant of the smaller sandpipers. A few winter in the southern provinces.

158. Limicola falcinella sibirica Dresser

Limicola sibirica Dresser, Proc. Zool. Soc. London, 1876, p. 674. (Siberia and China.)

English: Eastern Broad-billed Sandpiper.
Japanese: Kiriai (pair of gimlets.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (2) (LiWM); Sept. (Kur); 6 Sept. 1920 (SSC); 16 Sept. 1929 (Yam).

This species is known in Korea only from the above records. Hence it can be regarded only as a rare transient in early autumn on the northeast coast.

159. Philomachus pugnax (Linné)

Tringa Pugnax Linné, Syst. Nat., ed. 10, **1**, 1758, p. 148. (Sweden.)

English: Ruff, Reeve.

Japanese: Erimaki shigi (neck-cloth snipe.)

The Ruff is a straggler to Korea, known only from the single specimen taken 9 September 1913 at Sinpo, Hamgyong Namdo, and now in the Seoul Society of Natural History collection (*cf.* Kuroda, 1917, 30).

RECURVIROSTRIDAE

160. Himantopus himantopus himantopus (Linné)

Charadrius himantopus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 151. (southern Europe.)

English: Black-winged Stilt.

Japanese: Seitaka shigi (tall snipe.)

The only record for this straggler in Korea is that of Mori's (1928, 490). He identified and photographed a specimen in the collection of the Chinchon Common School, an adult male taken at Chinchon, Chungchong Pukto, in December 1925.

161. Recurvirostra avosetta Linné

Recurvirostra avosetta Linné, Syst. Nat., ed. 10, **1**, 1758, p. 151. (Italy.)

English: Avocet.

Japanese: Sorihashi seitaka shigi (bent-billed tall snipe.)

Specimen records:

Hamgyong Namdo — 15 Oct. 1912 (2) (LiWM).
Hwanghae Do — Oct. 1929 (SoM).
Cholla Pukto — 4 Jan. 1914 (Kur).

The Avocet is a straggler in Korea, known only from the above records.

PHALAROPODIDAE

162. Lobipes lobatus (Linné)

Tringa lobata Linné, Syst. Nat., ed. 10, **1**, 1758, p. 148. (Hudson Bay.)

English: Northern Phalarope.

Japanese: Aka eri hire ashi shigi (red-necked fin-footed snipe.)

Specimen records:

Hamgyong Pukto — 15–17 Sept. 1929 (5) (Yam).
Korea — 1872 (Finsch).

The Northern Phalarope is of casual occurrence in Korea. It is interesting that so rare a species should be one of the first of the birds reported from there, being one of the four species collected on islands off the coast in 1872 by Finsch. Until Orii collected the Hamgyong Pukto specimens, the only other mention of the species in literature was Kuroda's uncorroborated note (1917, 31) that it had been reported from Songjin, Hamgyong Pukto, in September. Being a pelagic bird, it may well be fairly common off the coast in migration, where nobody has ever collected or observed it.

GLAREOLIDAE

163. Glareola pratincola maldivarum Forster

Glareola (*Pratincola*) *Maldivarum* J. R. Forster, Faunula Indica, ed. 2, 1795, p. 11. (near Maldive Islands.)

The only record of this straggler in Korea is that of three specimens shot near Anju (Pyongan Namdo) 17 October 1931 by Won, who reported them twice (1932, 243) (1932, 3).

LARIDAE

164. Larus crassirostris Vieillot

Larus crassirostris Vieillot, Nouv. Dict. Hist. Nat., **21**, 1818, p. 508. (Nagasaki, Japan.)

English: Black-tailed Gull.
Japanese: Umi neko (sea cat.)

Specimen records:

Hamgyong Pukto — 14 Aug. 1880 (G & S); 29 Aug. 1917 (2) (LiWM); Nov. (Kur).
Hamgyong Namdo — 17 Aug. 1880 (G & S); 26 Apr. 1917 (3) (Kur).
Pyongan Pukto — 9 June, 1 July (7) 1917 (LiWM); 3 June 1918 (Taka); 14 Apr. 1929 (Yam).
Pyongan Namdo — 26 July 1932 (Won).
Hwanghae Do — 15 May-21 June (5) (Kur).
Kangwon Do — 23 Apr. (2), 23 Sept. (2) 1914 (LiWM).
Kyonggi Do — 15 Aug. 1915 (LiWM).

The Black-tailed Gull is a common summer resident along the Korean coast. The following nesting data were sent Kuroda (1923, 311, 312) by the lighthouse keeper at Nishi Island in Hwanghae Do, who collected for him two adults, three downy young, and six eggs between 5 May and 21 June 1922. "The birds are very numerous during the nesting season, but are absent from September to March. They arrive at the rookery early in April, and lay their eggs from early May to early June. They nest in interstices between the rocks, and lay two to three eggs per clutch. The young leave the island the end of August."

Yoshida (1923, 316) saw many at Yongampo Harbor in Pyongan Pukto 21 July 1923. It was reported to him by the inhabitants that "many thousands" breed at Sui-unto [perhaps Sin-to?], an island about seventeen miles from Yongampo, where the people go to collect the eggs for food. He was unable to visit the rookery to make certain of the species of gull which breeds there.

Mori (1939, 9) reports the 'Umi neko' as formerly very common breeding on Yob-do, a solitary island off the west coast of Pyongan Pukto, but evidently somewhat south of Sin Island. Of this rookery, which is also famous as the breeding ground of the Chinese Egret, he says "Black-tailed Gulls are the most numerous of all the species. Up until a few years ago this island was covered with their eggs every breeding season. The village office sold the eggs, which were brought to Pyongyang by ship. The eggs sold well to the citizens, for they have a superstition that people who eat them on the Boys' Festival Day will not fall sick during the coming year."

Mori adds (*idem*) that the Black-tailed Gull is also the most numerous of the species breeding on Ran Island, off the northeast coast of Hamgyong Pukto, where they "each lay two or three eggs, usually from the last of May to the beginning of June, making their nests of dry grass in the bushes on the west side of the island."

165. Larus canus kamtschatschensis (Bonaparte)

Gavina hinc *Larus kamtschatschensis* [sic] Bonaparte, Consp. Av. **2**, 1857, p. 224. (In synonymy of *Larus niveus* Pallas, 1811, not *Larus niveus* Boddaert, 1783.)

English: Asiatic Common Gull.
Japanese: Kamome (autochthonous.)

Specimen records:

Hamgyong Pukto — Nov. (Kur).
Kangwon Do — 1 Dec. 1914 (SSC).

Kyonggi Do — Oct. 1910, 15 Jan. 1911 (LiWM); 1 Nov. 1920 (SoM); 17 Mar. 1946 (MCZ).
Cholla Namdo — 19 Feb. 1930 (Yam).

The Common Gull is a not uncommon winter resident along the coasts. I observed it most frequently at the heads of the inlets, where one could almost always see two or three at any time from January through March.

166. Larus argentatus vegae Palmen

Larus argentatus Brünn. var. *Vegae* Palmén, in Nordenskiöld, Vega-Exped. Vetensk. Iakttag., **5**, 1887, p. 370. (Northeastern Siberia.)

English: Vega Herring Gull.
Japanese: Seguro kamome (black-backed gull.)

Specimen records:

Hamgyong Namdo — 16 Feb. 1888 (Tacz).
Pyongan Pukto — 30 May, 5 June 1917 (LiWM); 10 June 1917 (SSC).
Pyongan Namdo — 25 July 1932 (Won).
Kangwon Do — 30 Mar. 1914 (2) (LiWM).
Kyonggi Do — Mar. 1911, 4 Oct. 1914 (LiWM); 19 Apr. 1917 (Kur).
Cholla Namdo — 11 Apr. 1917 (Kur).

The Herring Gull is a common winter resident in the southern half of Korea, and a common transient along the coasts in spring and autumn. I found it common at Inchon in November and December, noticeably scarcer in January and February, and again plentiful in March and April.

167. Larus ridibundus sibiricus Buturlin

Larus ridibundus sibiricus Buturlin, Orn. Mitt., **2**, 1911, p. 66. (Kolyma Delta and Ussuriland.)

English: Kamchatkan Black-headed Gull.
Japanese: Yuri kamome (lily gull.)

Specimen records:

Hamgyong Pukto — 15–27 Sept. 1929 (6) (Yam).
Kyongsang Pukto — 23 Mar. 1916 (SSC); 25 Mar. 1927 (4) (Taka).

This species is an uncommon transient on the eastern coast of Korea. While it winters commonly in Honshu, its breeding areas in eastern

Asia are poorly defined, and little is known of its migration. It should appear in eastern Korea with more regularity than the collecting record shows.

168. Larus saundersi (Swinhoe)

Chroicocephalus saundersi Swinhoe, Proc. Zool. Soc. London, 1871, p. 273, pl. 22. (Amoy, China.)

English: Saunders' Gull.

Japanese: Tzuguro kamome (black-headed gull.)

Specimen records:

Hamgyong Namdo	— 16 Feb. 1888 (Tacz).
Pyongan Pukto	— 14 May 1917 (SSC).
Pyongan Namdo	— 13 May 1917 (2) (LiWM).
Kyonggi Do	— 18 Jan. 1928 (Taka).
Cholla Namdo	— 23 Feb. 1927 (Taka).

Saunders' Gull is an uncommon, irregular visitor to Korea. It breeds on the fresh water lakes of Mongolia and northern China, and winters to the coast from Japan to Formosa. Hence it should be of more frequent occurrence in Korea.

169. Chlidonias leucoptera (Temminck)

Sterna leucoptera Temminck, Man. d'Orn., 1815, p. 483. (Mediterranean coast.)

English: White-winged Black Tern.

Japanese: Hajiro kurohara ajisashi (white-feathered, black-bellied tern.)

The only Korean record for this straggler is that of Mori (1920, 252) who collected a male and two females at Suaseng, Kyonggi Do (north of Seoul) 24 May 1919. One of these was destroyed with the Kuroda collection, but the other two are still in the Seoul Society of Natural History collection.

170. Sterna hirundo longipennis Nordmann

Sterna longipennis Nordmann, in Erman's Verz. Thier. Pflanz., 1835, p. 17. (Mouth of the Kutchui River, Sea of Okhotsk.)

English: Nordmann's Tern.

Japanese: Ajisashi (mackerel stabber.)

Specimen records:

Hamgyong Pukto — 25 Sept. 1929 (Yam).
Hamgyong Namdo — 12 Sept. 1912 (SSC).
Pyongan Pukto — May 1927 (2) (SoM).
Kyonggi Do — 11 Apr. 1913 (SSC); Apr. 1917 (Kur).

Nordmann's Tern is apparently an uncommon spring and autumn transient. Won (1934, 115) calls it common. I did not see a single tern of any species during my stay in Korea.

171. Sterna albifrons sinensis Gmelin

Sterna sinensis Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 608. (China.)
English: Asiatic Least Tern.
Japanese: Ko-ajisashi (little mackerel-stabber.)

Specimen records:

Pyongan Namdo — 21, 29 June 1931 (Won).
Kyonggi Do — May, June 1887–8 (8) (Tacz); 25 June 1883 (USNM); 11 May 1909, 30 June 1913 (2), 5 July 1915 (LiWM); 1 Apr. 1912 (SSC); 29 Apr. (3), 20 June 1927 (2) (Taka).

The Least Tern is a not uncommon summer resident in coastal western Korea. Taczanowski (1888, 468) calls it "common in spring, rare in summer, gone in winter." Campbell (1892, 246) says "very common in the late spring and early summer." Kuroda (1917, 35) saw "a few" 29 April 1917 on the Taedong River [Pyongan Namdo]. Won (1934, 115) says it breeds in Pyongan Namdo, where it "lays four eggs on a sand bank." He sent Yamashina (unpublished ms.) a set of four eggs he collected there 21 June 1931.

172. Thalasseus bergii cristatus (Stephens)

Sterna cristata Stephens, in Shaw's Gen. Zool., **13**, pt. 1, 1826, p. 146. (China.)
English: Crested Tern.
Japanese: O-ajisashi (large mackerel-stabber.)

The Crested Tern is a straggler from the southward. The sole Korean record is that of Kuroda (1918, 519) who says "I have a specimen . . . said to have come from an island about 72 miles north of Chemulpo, Keiki Distr., July 5, 1917" [probably one of the outer islands off southern Hwanghae Do, actually east-northeast of Inchon].

ALCIDAE

173. Uria aalge inornata Salomonsen

Uria aalge inornata Salomonsen, Ibis, 1932, p. 128. (St. Matthews Island, Bering Sea.)

English: Bering Island Murre.
Japanese: Umi garasu (sea crow.)

Specimen records:

Hamgyong Pukto — 10 Mar. 1916 (SSC).
Kangwon Do — 30 Apr., 1 May 1914 (5) (LiWM); 28 Apr. (SSC); 1, 28 Apr., 1 May 1914 (Kur); 8 Feb. 1915 (2) (Taka).

This murre is resident on the eastern coast of Korea, and has bred on at least two islands there. How large these colonies are, and how far southward the birds move in winter are unknown. The specimens listed above from Kangwon Do were collected on the Kuk Islands, near Tongchon, in the northern part of the Province, whence presumably also came the six unlabelled eggs in the LiWong Museum. Mori (1939, 9) reports a large colony at Ran Island, in northeastern Hamgyong Pukto, where "several ten-thousands of Murres stay on the cliff on the east side, and numerous eggs are laid on the rocks with nothing of a nest. The color and marking of the eggs differ every one, none can be found alike. Usually the eggs are laid in the middle or last of June, each bird laying one egg."

174. Cepphus carbo Pallas

Cepphus Carbo Pallas, Zoogr. Rosso-Asiat., **2**, 1811, p. 350. (Kuriles.)

English: Sooty Guillemot.
Japanese: Keimafuri (autochthonous, but characters mean sea-dove.)

Specimen records:

Hamgyong Pukto — 10 Mar. 1916, 10 May 1935 (SSC).
Kangwon Do — 9 Apr.-1 May 1914 (7) (LiWM); 28 Apr. 1914 (3) (Kur); 28 Apr. (SSC); undated 1914 (Taka).

The Sooty Guillemot is resident on the east coast, but very little is known of its abundance or its movements. The specimens listed above from Kangwon Do were collected on the Kuk Islands, in the northern

part of the Province, where it probably breeds, though there is no positive evidence to that effect. However, it does breed at Ran Island in northeastern Hamgyong Pukto, where Mori (1939, 9) reports it as the third most numerous species in the rookery, fewer in numbers than the Black-tailed Gulls and Bering Murres, but more numerous than the Ancient Murrelets and Temminck's Cormorants. Mori (*idem*) adds it "lays two eggs per clutch, usually about the middle of May."

175. Brachyramphus marmoratus perdix (Pallas)

Cepphus Perdix Pallas, Zoogr. Rosso-Asiat., **2**, 1811, p. 351, pl. 80. (Bering Sea and Sea of Okhotsk.)

English: Partridge Auklet.

Japanese: Madara umisuzume (spotted sea-sparrow.)

Won (1934, 17) collected the one known Korean specimen of this straggler 13 June 1933, on the Taedon River, Pyongan Namdo.

176. Synthliboramphus antiquus (Gmelin)

Alca antiqua Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 554. (Bering Sea.)

English: Ancient Murrelet.

Japanese: Umi suzume (sea sparrow.)

Specimen records:

Hwanghae Do	— 5 Mar. 1922 (Kur).
Kangwon Do	— 24 Apr. 1914 (LiWM).
Chungchong Namdo	— 22 Feb. 1914 (SSC).
Cholla Namdo	— Dec. (SSC); 28 Apr., 18 Feb. (2), 13 Mar. 1931 (Uch); May 1932 (downy young) (Kur).

The Ancient Murrelet is a summer resident on both east and west coasts, and winters on the south coast. Ishizawa (1933, 279) writes of its breeding in Cholla Namdo: "Shichihatsu is a small isolated isle composed of rocks with a thick growth of *Carex borgandi*, a plant less than one meter high, and a few . . . small shrubs and nothing else. . . . This bird makes a slight hollow on the ground, lines it with a small quantity of dead grass and fallen leaves, and lays her eggs in it. . . . One clutch contains two eggs . . . They lay in Korea from the middle of March to the middle of April . . . The second egg is laid from 2 to 12 days after the first, a little less than six days apart on the average . . . The period of incubation is from 26 to 40 days, average 32 days, from

17 examples. . . . It is said the incubation is shared alternately by both male and female. Eggs are hatched on the same day or with the difference of one day; chicks are warmed for one or two days, leave the islet by night accompanying their parents and never return until the breeding season of the next year. Thus they all evacuate the islet by the end of May." There are two eggs in the Yamashina collection taken on Shichihatsu Island, Cholla Namdo, 24 March 1931.

Kuroda (1923, 312) had two eggs and two adults taken at Nishi Island, Hwanghae Do, where it lays from mid-March to early April. He quotes the lighthouse keeper there: "These birds are more numerous at Chilbaldo Island, Cholla Namdo, where several hundred eggs may be collected in a day, but at Nishi Island there are only several hundred birds." He (the light-keeper) once made a feather bed from the Murrelets at Chilbaldo.

Mori (1939, 9) lists the Ancient Murrelet as between the Sooty Guillemot and the Cormorant in abundance on Ran Island in northeastern Hamgyong Pukto, where it lays its two eggs late in April. Whether or not it nests at Kuk Island in Kangwon Do with the other alcids is not known, though it has been collected there.

177. Synthliboramphus wumisuzume (Temminck)

Uria wumisuzume Temminck, Pl. Col., livr. 98, 1835, pl. 579. (Shores of Korea and to Japan.)

English: Japanese Murrelet.

Japanese: Kammuri umisuzume (crowned sea-sparrow.)

This species, though endemic to Japan, is evidently only a straggler to Korea. Temminck's type material may have come from Tsushima. While the bird could be of more or less regular occurrence in winter off the south coast of Korea, the only record for the peninsula is that of Jouy (Clark, 1910), who collected two males in Kyongsang Namdo 20 April 1884, now preserved in the U. S. National Museum.

178. Cerorhinca monocerata (Pallas)

Alca monocerata Pallas, Zoogr. Rosso-Asiat., **2**, 1811, p. 362. (Cape St. Elias and Kodiak Island.)

English: Hornbilled Puffin.

Japanese: Utou (autochthonous.)

Specimen records:

Hamgyong Pukto — 20 Apr., 10 May 1935 (SSC).
Pyongan Pukto — 10 June 1917 (2) (LiWM); 10 June 1917 (SSC).
Kangwon Do — 30 Apr., 1 May 1914 (5) (LiWM); May 1916 (Taka); Apr. (Kur).
Kyongsang Namdo — Jan. 1925 (Kur).

The Hornbilled Puffin is a summer resident off the northeast and west coasts, but nothing is known of its abundance or its movements. There are several eggs in the LiWong collection, but they are without data, and as adults were collected for the museum on both coasts, there is no way of telling on which rookery they were taken. Mori (1939, 9) says it nests on Yob Island, near the Manchurian border in Pyongan Pukto, where it is more abundant than the Temminck's Cormorants, and less so than the Chinese Egrets.

PTEROCLIDIDAE

179. Syrrhaptes paradoxus (Pallas)

Tetrao paradoxa Pallas, Reise versch. Prov. Russ. Reichs, **2**, 1773, p. 712. (Southern part of the Tartarian Desert.)

English: Pallas' Sand Grouse.
Japanese: Sakei (sand-cock.)

Pallas' Sand Grouse is a straggler which has occurred but once in Korea. Iizuka (1912, 103) reports the two specimens in the Seoul School Collection. They were shot "three ri [about seven miles] down the Han River from Seoul" by a local sportsman in March or April, 1908, and were the only ones saved as specimens from a small flock of seven or eight, all of which were shot.

COLUMBIDAE

180. Columba livia rupestris Pallas

Columba Oenas β rupestris Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 560. (Dauria.)
Columba taczanowksii Stejneger, Proc. U. S. Nat. Mus., **16**, 1893, p. 624. (southern Korea.) (synonym.)

English: Blue Hill Pigeon.
Japanese: Korai bato (pigeon of old Korea.)

Specimen records:

Hamgyong Pukto — 1–30 May 1912 (6) (AMNH); 14–29 Aug. 1917 (4) (LiWM); July (Kur).
Hamgyong Namdo— Dec. 1912 (Kur).
Pyongan Pukto — 1 June 1917 (SSC); 6, 7, 12 June 1917 (LiWM); 5 May 1917 (Kur); 28 Dec. 1924 (SoM); 15, 18 Apr. 1929 (Yam).
Pyongan Namdo — 30 Apr. 1917 (4) (Kur); 28 Dec. 1924, 21 Oct. 1933 (Won).
Hwanghae Do — 24 Mar. 1914 (2) (LiWM); 5 Mar. 1927 (Taka).
Kangwon Do — 26, 28 Sept. 1914 (3) (LiWM).
Kyonggi Do — Apr. 1887 (Tacz); 4 Jan. 1913 (LiWM); Feb. 1917 (2) (Taka); 5, 9 Mar. 1929, 28 Jan., 22 Mar. 1930 (Won); 4 Mar. 1930 (SSC).
Cholla Namdo — 11 Apr. 1917 (Kur).
South Korea — 22 Nov. 1883 (USNM).

This pigeon is a common summer resident; a few may winter occasionally. Taczanowski (1888, 467) calls it "resident and common, lives in large numbers in the palace grounds." Kuroda (1918, 521) says "I have found this bird most abundant on a cliff at the mouth of River Daidoko [Pyongan Namdo]". Y. Kuroda (1935, 88) saw it in Chungchang Pukto 25 May 1931. Yamashina notes (1932) that a female killed by Orii in Pyongan Pukto 18 April 1929 had an egg in its oviduct with the shell all formed. There is a nest and eggs in the LiWong collection labelled "Iwa Bato [rock dove], Kyonggi Do, 20 May 1910." I saw the first and only one of these birds I encountered on 2 May 1946 the day before I left Korea.

181. Streptopelia orientalis orientalis (Latham)

Columba orientalis Latham, Index Orn., **2**, 1790, p. 606. (China.)

English: Eastern Turtle Dove.
Japanese: Kiji bato (pheasant dove.)

Specimen records:

Hamgyong Pukto — 27 Sept. 1917 (LiWM).
Pyongan Pukto — 7, 19 June 1917 (LiWM).
Pyongan Namdo — 18 June, 12 Nov. 1932 (Won).
Hwanghae Do — 23 Dec. 1916 (SSC).
Kangwon Do — 26 Sept. 1914 (LiWM).
Kyonggi Do — 14, 15 June, 6, 26 Aug. 1883, Dec. 1935 (USNM); Dec. 1887 (Tacz); 6 Aug., 29 Nov. 1909 (LiWM); 19–22 Apr. 1917 (5) (Kur); 9, 11, 15 Dec., 5 Mar. 1928, 2 Nov., 25 Dec. 1929 (Won); 3, 14 Oct. 1933 (Uch); 25 Nov. 1945, 26 Feb., 26 Mar. 1946 (MCZ).

Cholla Namdo — Jan. (Kur); 17 Oct. 1925, 20 Mar. 1931 (Uch).
Kyongsang Namdo — 25 Dec. 1914 (LiWM).

The Turtle Dove is a common permanent resident in the Seoul-Suwon area. About seventy-five of them wintered in the vicinity of the Suwon Experiment Station. They foraged daily in the orchards and mulberry fields, and roosted at night in the tops of a stand of young pine on the grounds of the Forestry School. I first heard their courtship song during a mild spell 10 February, but by the end of that month courtship was being pursued earnestly. On 10 March I found a nest with two eggs in a small pine next to one of our laboratory buildings. The eggs hatched 1 April, and the squabs disappeared three weeks later (not, I believe, of their own volition.) Kobayashi (1932) reports finding a nest with two eggs in Hwanghae Do 24 March 1931; Won sent Yamashina (unpublished ms.) a nest and two eggs he collected in Pyongan Namdo 28 May 1934. The species probably rears two broods each year.

182. Streptopelia decaocto stoliczkae (Hume)

Turtur stoliczkae Hume, Stray Feathers, **2**, 1874, p. 519. (Kashgar.)
Streptopelia decaocto koreensis Buturlin, Polnyi opredelitel' ptits S.S.S.R., 1934, **1**, p. 226 (nom. nov. for *S. d. torquata* Bogdanov, Turkestan, partim.)

English: Eastern Ring Dove.
Japanese: Shira kobato (white small dove.)

Specimen records:

Hamgyong Pukto — Aug. 1929 (Yam).
Hamgyong Namdo — Aug. (Kur).
Pyongan Pukto — 24 May, 19 June (2) 1917 (LiWM).
Hwanghae Do — 20 Feb. 1916 (3) (LiWM).
Kyonggi Do — 17 June, 21, 23 Sept. 1883 (USNM); Nov., Dec. 1887, May 1888 (4) (Tacz); Feb. 1910 (LiWM); 1 Feb. 1918 (Kur); 1 Dec. 1927, 18 Jan. 1928 (2) (Taka).
Kyongsang Pukto — 27 Mar. 1918 (SSC).

The Ring Dove is evidently an uncommon resident of local distribution, formerly more abundant than it is today. Taczanowski (1888, 467) found it "resident and common" in his time, but Won (1934, 109) never collected it, and calls it rare. There is a nest and eggs in the LiWong Museum from Kyonggi Do, 23 May 1910.

183. Streptopelia tranquebarica humilis (Temminck)

Columba humilis Temminck, Pl. Col., livr. 44, 1824, pl. 259. (Bengal and Luzon.)

English: Burmese Red Turtle Dove.
Japanese: Beni bato (red dove.)

This species is a straggler, collected but once, in Myongchon, Hamgyong Pukto, March, 1928 (see Mori, 1929, 105).

CUCULIDAE

184. Cuculus fugax hyperythrus Gould

Cuculus hyperythrus Gould, Proc. Zool. Soc. London, 1856, p. 96. (China, *ie* Shanghai.)

English: Chinese Hawk-cuckoo.
Japanese: Juichi (imitative of voice, but means eleven.)

Specimen records:

Pyongan Pukto — Sept. 1915, 27 July 1917 (SSC); 26 May 1917 (5) (LiWM); no date (Kur); 27 May, June 1917 (Taka); 21, 25 May 1929 (5) (Yam).
Cholla Namdo — 29 Sept. 1928 (Uch).

This cuckoo seems to be a not uncommon migrant in spring in the northwest corner of Pyongan Pukto. It is significant that a fair series has been taken on two separate occasions in the same area at the same time of year. The species apparently migrates along the coast of the mainland, and goes directly northward or northeastward along the Korea-Manchuria boundary instead of spreading down into the Korean peninsula.

Yamashina (1941, 607) comments "it is not yet certain that they breed in Korea, but according to the collection dates, there is no doubt they do so." This conclusion seems a bit far-fetched, however, and the 1942 Hand-List Committee was not convinced of its breeding.

185. Cuculus micropterus micropterus Gould

Cuculus micropterus Gould, Proc. Zool. Soc. London, 1837, p. 137. (Himalyas).

English: Indian Cuckoo.
Japanese: Seguro kakko (black-backed cuckoo.)

Specimen records:

Pyongan Pukto — 24 May 1917 (SSC); 31 May 1917 (LiWM); 31 May 1917 (Kur); 24 May 1929 (Yam).

This species is an uncommon migrant in northwestern Korea. Its status is practically identical with that of the previous species, except that, from the record, it is perhaps slightly less plentiful.

186. Cuculus canorus telephonus Heine

Cuculus telephonus Heine, Journ. f. Orn., **11**, 1863, p. 352. (Japan.)

English: Japanese Cuckoo.

Japanese: Kakko (autochthonous, from the voice.)

Specimen records:

Hamgyong Pukto — 28 Sept. 1917 (3) (LiWM).
Pyongan Namdo — 22 Apr. 1936 (Won).
Kyonggi Do — Nov. 1887 (Tacz); 27 June 1888 (Camp); June, 1909, 14, 20 June, 7 July 1914 (4) (LiWM); 10 June 1914 (SSC); 12 May 1926 (SoM); 15 June 1926 (Won); 1, 4, 29 Sept. 1927, 29 Apr. 1930 (Taka).
Cholla Namdo — 21 Aug. 1930 (Uch).
Kyongsang Namdo — 23 May 1886 (USNM).

The Cuckoo is a not uncommon summer resident. Taczanowski (1888, 466) notes "Common in summer. Our voyageur constantly heard the song of the male like that of the European cuckoo, and never that of *Cuculus indicus*." Campbell (1892, 243) writes of observing it "as late as the beginning of September." Won (1934, 98) says it is common and breeds. Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. That Orii did not collect it does not speak well of its abundance, but Yamashina (1941, 580) says "they breed in Korea," in which the 1942 Hand-List concurs. There is no evidence, however, of the breeding of this parasitic species in Korea other than the dates of the specimens collected.

187. Cuculus saturatus horsfieldi Moore

Cuculus horsfieldi Moore, in Moore and Horsfield, Cat. Bds. Mus. Hon. East-India Co., **2**, 1856–58 (1857), p. 703. (Java.)

English: Himalayan Cuckoo.

Japanese: Tsutsudori (pipe or tube bird.)

Specimen records:

Hamgyong Pukto — 28 Sept. 1917 (2) (LiWM).
Pyongan Pukto — 26, 31 May 1917 (3) (LiWM); 27 May 1917 (Kur); 8 May-1 June 1929 (10) (Yam).
Pyongan Namdo — 24 May 1932, 13 June 1933 (Won).
Kangwon Do — 8 Sept. 1914 (LiWM).
Kyonggi Do — 9 June 1909 (2), 10 Oct. 1914, 27 June 1915, 17 Oct. 1917 (LiWM); 10 June 1914 (SSC); 15 May 1924 (SoM); 10 June 1926 (Won); 1 Sept. 1927, 20 Sept. 1929 (im.) (Taka); 9 May 1934 (Uch).
Cholla Namdo — 17, 29 Sept. 1931, 17 Aug. 1933 (Uch).
Kyongsang Namdo — 25 Sept. 1885, 30 Apr. 1886 (USNM).

The Himalayan Cuckoo is a common spring and autumn transient, passing through Korea in late spring and early autumn, and probably a summer resident. Won (1934, 98) calls it common and breeding. Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. Yamashina (1941, 591) also says it nests in Korea, but inasmuch as the only breeding evidence is the immature specimens formerly in the Taka-Tsukasa collection, the 1942 Hand-List does not consider that status warranted.

188. Cuculus poliocephalus poliocephalus Latham

Cuculus poliocephalus Latham, Index Orn., **1**, 1790, p. 214. (India.)

English: Little Cuckoo.

Japanese: Hototoguisu (autochthonous, probably imitative.)

Specimen records:

Pyongan Pukto — 26 May 1917 (LiWM); 24 May 1929 (Yam).
Pyongan Namdo — Aug. 1916 (Kur).
Kyonggi Do — 12 Aug. 1926 (Won); 12 Aug. 1929 (SoM).
Cholla Namdo — 24 Oct. 1912, 21 Aug. 1930 (Uch).

The Little Cuckoo is a rare spring transient, perhaps a rare summer resident. Won (1934, 98) says it is "rare, breeds deep in the mountains." Yamashina (1941, 697) also ventures that "a few breed in Korea," in spite of the lack of evidence. The 1942 Hand-List just gives it as occurring in Korea, which is about all that can be said about it until more positive data are collected.

STRIGIDAE

189. Otus scops stictonotus (Sharpe)

Scops stictonotus Sharpe, Cat. Bds. Brit. Mus., **2**, 1875, p. 54, pl. 3, f. 2. (China.)

English: Chinese Scops Owl.

Japanese: Chosen konoha zuku (Korean tree-leaf owl.)

Specimen records:

Hamgyong Pukto — 28 Aug., 5 Oct. 1929 (Yam).
Pyongan Pukto — Sept. (Kur); 28 Apr.-12 May 1929 (5) (Yam).
Pyongan Namdo — 1 Nov. 1936 (Won).
Kyonggi Do — 27 Oct. 1887 (Tacz); 23 Apr. 1917 (Kur); 3 May 1917 (LiWM); May 1925 (SoM); 10 Dec. 1927 (Taka); 7 May 1928, 26 Apr. 1929 (Won); 9 May 1934 (Uch).

This owl is a not uncommon transient in spring and autumn, and perhaps a summer resident in the northern provinces. There is an early record of "an unusually dark-colored specimen" mentioned by Tristram (1885, 194) collected off the coast by Lt. Gunn in 1884. Won (1937, 4) calls it a common year-round resident and states that it breeds in mid-June at Anju, Pyongan Namdo, laying two white eggs in a hollow tree. Not yet collected in central and southern Korea in summer, but if they breed in Korea, it must be this subspecies. They pass through Hamgyong Pukto and Pyongan Pukto abundantly in spring and autumn. A few winter at Seoul and Kyongsang Namdo." There is a nest and eggs in the LiWong collection that might be attributable to this species. It is without locality, presumably Kyonggi Do, labelled "Kahi zuku, 23 May 1910."

190. Otus asio ussuriensis (Buturlin)

Scops semitorques ussuriensis Buturlin, Orn. Mitt., **1**, 1910, p. 119. (Khanka Lake, Ussuriland.)

English: Feather-toed Scops Owl.

Japanese: O-konoha zuku (large tree-leaf owl.)

Specimen records:

Hamgyong Pukto — 6 Nov. 1915 (SSC); 15–27 Oct. 1929 (17) (Yam).
Pyongan Namdo — 26 Nov. 1932, 17 Jan. 1934 (Won); 5 Feb. 1935, Jan. 1936 (Taka).
Hwanghae Do — 19 Jan. 1919, 20 Dec. 1926 (Taka).

Kyonggi Do — Feb. 1888 (Tacz); Jan. 1889 (Camp); Feb., Mar., May 1909, 30 Oct. 1910 (LiWM); 2 Mar. 1919, 10 Dec. 1927 (Taka); Sept. 1925 (SoM); 1 Nov. 1935 (Uch); 28 Dec. 1934, Jan. 1937, 25 Feb., 24 Dec. 1939, 27 Dec. 1945, 1, 29 Mar. 1946 (MCZ).
Cholla Namdo — Apr. 1915 (Taka); 8 Feb. 1930 (Yam).
Kyongsang Namdo — 20 Mar., 3, 10 May 1884 (USNM); 18 Jan. 1912, 27 Dec. 1914 (LiWM).

This species is a common spring and autumn transient throughout Korea, and a not uncommon winter resident in the central and southern portions. Yamashina (1941, 632) and Won (1934, 94) both say it breeds in Korea, but the 1942 Hand-List disagrees. Indeed, the evidence suggests that it breeds north of the Korean peninsula, for Orii's experience in collecting so large a series in Hamgyong Pukto in so short a time can be interpreted as nothing but a mass migratory movement he encountered there.

Cumming (1933, 47) writes "One may often see the poor dried shell of this little owl swaying in the breeze and dust in front of a Korean street shop. It makes good medicine for various ills."

191. Bubo bubo tenuipes Clark

Bubo tenuipes Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 470. (Fusan, Korea.)

English: Clark's Eagle Owl.
Japanese: Washi mimizuku (eagle eared-owl.)

Specimen records:

Pyongan Pukto — Nov. 1915 (LiWM).
Hwanghae Do — 8 Dec. 1926 (Taka); May 1936 (USNM).
Kangwon Do — 3 Oct. 1914 (LiWM).
Kyonggi Do — 4 Nov. 1887 (Tacz); Jan. 1889 (Camp); Feb., Nov. 1909 (LiWM); 20 Mar. 1913, 25 Jan. 1929 (SSC); Nov. 1916, Apr. 1917, 30 Dec. 1921 (Kur); Nov. 1926 (SoM); 12 Nov. 1927, 10 Feb. 1928 (Taka); 11 Jan. 1932, 1 Jan. 1935, 6 June (2), 10, 16 Dec. 1937, 30 Apr. 1938, 27 Dec. 1946 (MCZ).
Chungchong Pukto — 25 Feb. 1911 (LiWM); 2 Feb. 1919 (Taka).
Cholla Namdo — 12 Jan., 12 Feb. 1930 (Yam).
Kyongsang Namdo — 17 Dec. 1883, 20 Feb. 1884 (USNM); 19 Dec. 1914 (LiWM); 19 Jan. 1919 (Taka).

The Eagle Owl is a not uncommon resident in Korea. Taczanowski (1888, 461) says "resident, quite common; one sees it hunting its prey a-wing." Campbell (1892, 243) writes "common in Corea, and many specimens have passed through my hands." Kuroda (1918, 524) purchased a downy young Eagle Owl collected near Seoul in April 1917. Kobayashi (1938, 203) lists two eggs from Kyonggi Do, noting "the bird nested on the ground under a cliff, and the bed for the eggs was lined with rabbit hair. In a Cholla Namdo example the eggs were laid on the ledge of a rock facing the river." Adachi (1941, 66) says it nests on cliffs at Paekto San. The bird I collected at Suwon 27 December 1945 was, with dignity and unconcern, undergoing a furious mobbing by crows and magpies in the scant woods near the Forestry College, immediately after the first heavy snowfall of the season.

192. Nyctea scandiaca (Linné)

Strix scandiaca Linné, Syst. Nat., ed. 10, **1**, 1758, p. 92. (Lapland.)
English: Snowy Owl.
Japanese: Shiro fukuro (white owl.)

The Snowy Owl is a rare winter straggler to Korea, known there from one sight record and one specimen. The species was first reported by Taczanowski (1888, 459) as seen near Wonsan, Hamgyong Namdo, late in February 1888, by his collector, Kalinowski, who most certainly could not have mistaken anything else for a Snowy Owl. The only other record is the specimen in the Seoul School Collection, taken at Yesan, Chungchong Namdo, in December 1912.

193. Surnia ulula ulula (Linné)

Strix Ulula Linné, Syst. Nat., ed. 10, **1**, 1758, p. 93. (Sweden.)
English: Hawk Owl.
Japanese: Onaga fukuro (long-tailed owl.)

The only Korean record of this straggler is a specimen collected by the Kyoto University Expedition in Hamgyong Namdo, 13 January 1935 (Mori, 1935, 11). It was "killed in daylight, hunting shrews, two of which were in its stomach."

194. Ninox scutulata (Raffles)

Strix scutulata Raffles, Trans. Linn. Soc. London, **13**, pt. 2, 1822, p. 280. (Sumatra.)

Ninox scutulata ussuriensis Buturlin, Orn. Mitt., **1**, 1910, p. 187. (Ussuri and Korea.)

English: Brown Hawk-owl.
Japanese: Aoba zuku (green-leaf owl.)

Specimen records:

Ninox scutulata ussuriensis:

Hamgyong Pukto	— 16 Oct. 1929 (Yam).
Pyongan Pukto	— 8–21 May 1929 (3) (Yam).
Pyongan Namdo	— 6 Jan. 1931 (Won).
Kyonggi Do	— 3 Dec. 1927 (Taka); 25 Jan. 1929 (Kur).

Ninox scutulata scutulata:

Hamgyong Namdo	— 19, 21 Sept. (Kur).
Pyongan Pukto	— 26 May, 3 June 1917 (LiWM); Sept. (Kur).
Pyongan Namdo	— Oct. 1934 (Won).
Kyonggi Do	— 24 Aug., 18 Sept. (2), 21 Sept. (3) 1883 (USNM); May 1888 (Tacz); May 1889 (Camp); 8 June 1909 (2), 12 June 1913 (2), 12 July 1914 (LiWM); July 1917 (Kur); 20 May 1927, 30, 31 Apr. 1930 (Taka); 10 Sept. 1917, 10 May 1926 (SSC); June 1928 (SoM); 25 Apr. 1929 (Won); 14 July 1937, 24–28 Apr. 1946 (4) (MCZ).
Cholla Namdo	— 2 Dec. 1927, 28 Sept. 1928 (Uch).
Kyongsang Namdo	— 3–31 May 1884 (5), 29 Sept. 1885 (13), 30 Apr. 1886 (USNM).

N. s. ussuriensis is a common spring and autumn transient in the northern provinces, and a winter visitor as far south as Kyonggi Do. *N. s. scutulata* is a common migrant and a not uncommon summer resident in the central and southern provinces. On migration the bird moves diurnally through the forest lands, and is not overly shy. Jouy, from his collecting data, evidently encountered several migrations in Kyonggi Do and Kyongsang Namdo. I experienced one at Suwon in late April, during which I collected four specimens.

195. Athene noctua plumipes Swinhoe

Athene plumipes Swinhoe, Proc. Zool. Soc. London, 1870, p. 448. (Chihli, n.e. China.)

English: Eastern Little Owl.
Japanese: Ko kinme fukuro (little golden-eyed owl.)

From the record this species is a straggler, but further investigation may show it to be of fairly regular occurrence as a winter visitor. Won (1932, 1) shot a male and female at Anju, Pyongan Namdo, 11 and 16 November, 1931, which he sent to Kuroda for identification, and the latter (1932, 192) also published a description of the same specimens. Won (1932, 13) took a third specimen, a male, in the same locality 27 February 1932, which was destroyed with the Kuroda collection. So far as can be determined, Won had no other data on the species than the three specimens he collected, but in a later paper (1934, 99) he says the species is rare, but breeds in Korea. Kuroda (*idem*) says "rare in Korea, but a permanent resident surely by the date of the specimen," which is as unwarranted by the evidence as Won's breeding statement.

196. Strix aluco ma (Clark)

Syrnium ma Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 471. (Fusan, Korea.)

English: Korean Wood Owl.

Japanese: Mori fukuro (owl of the woods.)

Specimen records:

Pyongan Namdo	— 29 May 1931 (Won).
Kangwon Do	— 19 Dec. 1912 (LiWM).
Kyonggi Do	— Mar. 1888 (2) (Tacz); June 1909, Feb. 1911 (LiWM); 1912 (SSC); 23 Apr. (2), May 1917, Jan. 1925 (Kur); 25 Nov. 1930 (Won); 24 Dec. 1936, 13 May (2 downy young), 20 Dec. 1937, 29 Jan., 25 Feb. 1939, 20 Apr. 1946 (MCZ).
Kyongsang Namdo	— Mar. 1885 (USNM).

The Wood Owl is an uncommon resident. Taczanowski (1888, 462) says it is "resident and rare." Kuroda (1918, 525) collected an adult female and a white downy young in Kyonggi Do 23 April 1917. The two M.C.Z. specimens taken 13 May 1937 in Kyonggi Do are half-grown downy young, collected by the students at Chosen Christian College. I shot my single specimen in the forest south of Suwon.

197. Strix uralensis coreensis Momiyama

Syrnium uralense japonicum Clark, Proc. U.S.Nat.Mus. ,**32**, 1907, p. 471. (Hokkaido.) (preoccupied by *Strix hirsuta japonica* Temminck & Schlegel, 1847.)

Strix uralensis coreensis Momiyama, Journ. Chosen Nat. Hist. Soc., no 4, 10 Jan. 1927, p. 1. (Taianzan, Hamgyong Pukto.) Type formerly in Kuroda collection.

Strix uralensis morii Momiyama, Bull. B.O.C., **48**, 3 Nov. 1927, p. 21. (near Seoul, Kyonggi Do.) Type in Momiyama collection. (Synonym.)

English: Yezo Ural Owl.
Japanese: Yezo fukuro (Yezo owl.)

The few Korean specimens available are inseparable from the breeding form of Hokkaido. Though Momiyama's two races are both invalid, evidently based on slight individual variants, his name *coreensis* is the next one available to replace Clark's preoccupied *japonicum*.

Specimen records:

Hamgyong Pukto — 29 May 1912 (AMNH); Jan. 1920 (Kur) (Type of *coreensis*.)
Pyongan Namdo — no data (Mom).
Kyonggi Do — 5 Mar. 1927 (Mom) (type of *morii*); 3 Apr. 1928 (Taka).

The Ural Owl is a rare visitor to Korea. Though Won (1934, 99) says it breeds there, there is no proof. Won never collected the species.

198. Asio otus otus (Linné)

Strix Otus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 92. (Sweden.)

English: Long-eared Owl.
Japanese: Torafu zuku (tiger-striped owl.)

Specimen records:

Hamgyong Pukto — 6 Nov. 1915 (SSC); 19–22 Oct. 1929 (4) (Yam).
Pyongan Pukto — 4 Apr. 1929 (Yam).
Pyongan Namdo — 3 Jan. 1927 (Taka).
Kangwon Do — 21 Sept. 1926 (Taka).
Kyonggi Do — 26 Mar. 1918 (SSC); Jan. 1927 (Kur); 15 Sept. 1926 (Taka); 28 Jan. 1930 (SoM).
Kyongsang Namdo — 5, 13 Dec. 1883 (USNM); 24 Dec. 1914 (LiWM).

The Long-eared Owl is a not uncommon winter visitor. Won's statement (1934, 198) that it breeds in Korea is unsupported by the evidence. Yamashina's summation (1941, 672) says it "may be found in Korea in autumn, winter and spring, but it is not known to breed there."

199. Asio flammeus flammeus (Pontoppidan)

Strix flammea Pontoppidan, Danske Atlas, **1**, 1763, p. 617, pl. 25. (Sweden.)
English: Short-eared Owl.
Japanese: Ko mimizuku (small eared owl.)

Specimen records:

Hamgyong Pukto — Nov. (Kur).
Pyongan Pukto — 27 Sept. 1915 (SSC); 14 Apr. 1929 (Yam).
Pyongan Namdo — Dec. 1912 (LiWM).
Kyonggi Do — 29 Jan. 1888 (2) (Tacz); 24 Mar. 1910, Jan. 1911, 15 Dec. 1912 (LiWM); Jan. 1927 (Kur); 8 Nov., 10 Dec. 1927, 10, 21 Jan. 1928, 15 Apr. 1930 (Taka); 14 Feb. 1930 (SoM); 14 Nov. 1930 (Won); 4 Dec. 1934, 1, 28 Jan. 1946 (MCZ).

The Short-eared Owl is a not uncommon winter visitor. Taczanowski (1888, 457) says "one usually sees a few during the winter." I encountered a pair at dawn on 1 January 1947, coursing over the paddies, and collected both of them. I shot a single bird at dusk on the 28th. I also saw the species several times during February, usually flying over the orchard in the late afternoon or early morning.

CAPRIMULGIDAE

200. Caprimulgus indicus jotaka Temminck and Schlegel

Caprimulgus jotaka Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 37, pl. 12, 13. (Japan.)
English: Japanese Goatsucker.
Japanese: Yotaka (night hawk.)

Specimen records:

Pyongan Pukto — 26, 26 May 1917 (LiWM); 10 June 1917 (SSC); 12–21 May 1929 (3) (Yam).
Kyonggi Do — May 1888 (Tacz); Sept. (Kur); 2 June 1928 (SoM); 10 June 1928 (Taka); 28 May 1928, 4 June 1929 (Won); 9 May 1934 (Uch).
Cholla Namdo — 2 May 1927 (2) (Uch).
Kyongsang Namdo — 28 Apr. 1884 (USNM).

The Japanese Goatsucker is an uncommon summer resident in Korea. Tristram (1885, 194) lists a "dark colored specimen" taken in 1884 by Lt. Gunn somewhere along the coast. Taczanowski (1888, 462) calls it "rare in summer." Yoshida (1922) gives a sight record for Hwanghae Do in mid-July and Y. Kuroda (1935, 88) another for Chungchong Pukto 25 May 1931. Hashimoto (1937) observed three goatsuckers at Hachibi Island, Kyonggi Do, 9 May and again on 18 September 1934. Cumming (1935, 95) writes "not common in Korea." On the other hand Won (1934, 95) says it is common and breeds. While Yamashina (1933, 451) thinks it must "surely breed in Korea," the 1942 Hand-List more conservatively lists it only as occurring.

APODIDAE

201. Hirund-apus caudacutus caudacutus (Latham)

Hirundo caudacuta Latham, Index Orn., Suppl., 1801, p. lvii. (New South Wales.)

English: Needle-tailed Swift.

Japanese: Hario amatsubame (needle-tailed rain-swallow.)

Specimen records:

Hamgyong Pukto	— 9 Sept. 1917 (2) (LiWM); 29 July 1929 (4) (Yam); 30 Aug. 1929 (Won).
Pyongan Pukto	— 16 May 1929 (Yam).
Pyongan Namdo	— 1 Oct. 1932 (Won).
Kangwon Do	— 15, 26 Sept. 1914 (LiWM); Sept. 1917 (SSC).
Kyonggi Do	— 26 Sept. 1883 (USNM); 8 Oct. 1934 (SoM).
Kyongsang Pukto	— 21 Nov. 1927 (Kur).
Cholla Namdo	— no date, 1930 (Uch).

The Needle-tailed Swift is an uncommon migrant throughout Korea. It is perhaps a more common migrant and an uncommon summer resident in the extreme north. Taczanowski (1888, 459) found it "rare during migration." Won (1934, 95) says it is rare at Anjiu, Pyongan Namdo, but that a few breed at Musan, Hamgyong Pukto. Yamashina (1933, 443) says it "breeds in the mountains" (on the basis of Orii's field notes), in which the 1942 Hand-List concurs. Nevertheless the only breeding evidence is Orii's July collecting date.

202. Apus pacificus pacificus (Latham)

Hirundo pacifica Latham, Index Orn., Suppl., 1801, p. lviii. (New South Wales, *terra typica* = Vladivostok.)

English: Large White-rumped Swift.
Japanese: Ama tsubame (rain swallow.)

Specimen records:

Hamgyong Pukto — 28 Aug. 1917 (3) (LiWM).
Pyongan Pukto — 3, 4, 9 June 1917 (5) (LiWM); 29 May 1929 (Yam); 4 June 1917 (Taka).
Pyongan Namdo — no date 1931 (SoM); 4 July 1932 (Won).
Hwanghae Do — 15 May — 21 June 1922 (3) (Kur).
Kangwon Do — 3 July 1929 (7) (Yam).
Cholla Namdo — 14 May 1930 (Uch).
Kyongsang Namdo — 2 May 1886 (USNM).

The White-rumped Swift is a locally common summer resident. Kuroda (1918, 526) observed it on the Daidoko River in Pyongan Namdo 29 April 1917, and Yoshida (1923, 316) gives sight records for Hwanghae Do and Pyongan Pukto in mid-July. Won (1934, 95) calls it common in Pyongan Namdo, and says it nests there in an old castle near Anju.

The species is known definitely to breed in Korea only on off-shore islands in the sea-bird rookeries. Mori (1939, 7) says it lays from three to five eggs from the last of May to the beginning of June on Ran Island, near the Manchurian border in Hamgyong Pukto. Kuroda (1923, 309) quotes the light-keeper at Nishi Island in Hwanghae Do, who sent him two adults, a nest with eggs and a nestling, all collected on that island between 15 May and 21 June 1922: "The swifts arrive from the last of March to the middle and last of May. They lay eggs from the last of May to the last of June in small, swallow-like nests in the interstices of the rocks." Kobayashi (1938, 184) states "they usually lay two eggs in Honshu and Korea."

Hachimoto (1932) notes their arrival at Shichihatsu Island in Cholla Namdo 28 March 1930, 28 March 1931 and 4 April 1932. They began incubating there 25 May 1931, and the young left the nest 27 July. He says most of them depart before October, but he records one late straggler 1 November 1930. At Hachibi Island in Kyonggi Do he first observed them 9 April 1935, and saw the last of them 22 Sept. 1935, but in 1936 he watched a flight of 200 swifts go by 7 October.

Cumming (1933, 41) writes "In Korea it is found in the high mountains or on the rocky islands along the coast but may be seen in swift flight over the valleys at rare intervals during the summer, more often in late afternoon than at any other hour of the day. Out on the hills near Wonsan on a late summer day I watched a flock of from sixty to seventy of these swifts first in flight around and across the tops of the hills and then in a whirling circling mass rising rapidly until they could barely be seen far up in the sky. . . ."

ALCEDINIDAE

203. Ceryle lugubris lugubris (Temminck)

Alcedo lugubris Temminck, Pl. Col., livr. 92, 1834, pl. 528. (Japan.)

English: Japanese Pied Kingfisher.
Japanese: Yama semi (mountain kingfisher.)

Specimen records:

Hamgyong Namdo — 1 Dec. 1886 (Tacz).
Kangwon Do — Feb. 1917 (LiWM); Apr., (Kur).
Kyonggi Do — Nov. 1909, 2 Jan. 1910 (LiWM); undated (Kur).
Kyongsang Pukto — no date, 1912 (SSC).

This species is an uncommon winter visitor, straggling irregularly from Japan. Taczanowski (1888, 463) says Kalinowski met it "only in winter near Wonsan; there were four along a stream, all were shot and wounded, but only one recovered; after that it was never seen." Cumming (1933, 43) writes "In Korea . . . nowhere common. One may hear this kingfisher often as he flies far overhead or lower through the cover of hillside woods, passing from one streamside feeding place to another. The call is so loud and raucous that one knows of the bird's presence though it is not seen."

204. Alcedo atthis bengalensis Gmelin

Alcedo bengalensis Gmelin, Syst. Nat., **1**, pt. 1, 1788, p. 450. (Bengal.)

English: Common Indian Kingfisher.
Japanese: Kawa semi (river kingfisher.)

Specimen records:

Hamgyong Pukto — 15, 24 Aug., 1 Oct. 1917 (LiWM).
Hamgyong Namdo — 16 Aug. 1880 (4) (G & S); 27 July 1886 (USNM).
Pyongan Pukto — 19 June 1918 (LiWM); 22 Apr.-22 May 1929 (4) (Yam).
Pyongan Namdo — 4 Sept. 1912 (Taka); 17 Apr. 1932 (Won).
Kangwon Do — 3 Aug. 1914 (LiWM).
Kyonggi Do — 28 May, 31 July, 21 Aug., 10 Sept. 1883 (USNM); Apr., May, July 1887 (Tacz); June, July 1909, 20 June 1915, 28 May 1916 (LiWM); 20 Sept. 1917 (SSC); 2 Apr. 1917, 5 Oct., 18 Nov. 1927 (Taka); 9 Sept. 1929, 10 Sept., 20 Oct. 1930 (Won); 2 Oct. 1929 (SoM); 30 Mar.-1 May 1946 (7) (MCZ).
Cholla Namdo — 11 Nov. 1925, 29 Apr. 1932 (Uch).
Kyongsang Namdo — 15 Apr., 25 May, 2 June, 15, 26 Sept. 1886 (USNM).

This little Kingfisher is a common summer resident. As Cumming says, (1933, 44) it "may be seen along the watercourses and the seashore all over Korea; usually solitary, but sometimes two or three within calling distance of each other on some rock or piece of driftwood . . ." The first one arrived over the lake at Suwon 29 March 1946, and I collected it the next day. The next one appeared a week later, and more straggled in continually from then on. By mid-April it was common on all the lakes and streams.

Kuroda (1918, 523) had seven eggs "taken from two nests at Ojuri, near Seoul, June 2, 1917." There is a nest and eggs in the Li Wong Museum labelled "Ruri shobin, 27 May," no locality. Y. Kuroda and Miyakoda (1919, 150) give its season near Seoul as from mid-April to late October, and add that it breeds in stream banks.

205. Halcyon coromanda major (Temminck and Schlegel)

Alcedo (*Halcyon*) *coromanda major* Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1848, p. 75, pl. 39. (Japan.)

English: Japanese Ruddy Kingfisher.
Japanese: Aka shobin (red kingfisher.)

Specimen records:

Pyongan Pukto — 20 July 1917 (Taka).
Kangwon Do — 9 July 1929 (Yam).
Kyonggi Do — 28 Aug. 1887 (Tacz); July 1909, 30 May 1914, 20 June 1915 (2) (LiWM); 10 June 1914, 30 Aug. 1931 (SSC); 6 May 1926 (2) (SoM).
Kyongsang Pukto — 12 June 1917 (Kur).
Cholla Namdo — 26 May 1931 (Uch).

This species is an uncommon summer resident. Of the August specimen Kalinowski collected, Taczanowski remarks (1888, 450) "the only one seen in two and a half years in the country." However, Won (1934, 96) calls it common, and Cumming (1933, 5) considers it as a permanent resident, indicating that a few may winter in the southern end of the peninsula, despite the absence of specimen records. He adds (1933, 45) "it is both a shy and solitary bird in general habits, even with its bright plumage difficult to find in the deep foliage of the trees along some mountain stream where it feeds." The only breeding evidence beyond the hearsay of all writers and the summer collecting dates is a set of eggs with nest in the LiWong collection labelled "Shobin, Kyonggi Do, 5 June 1910."

206. Halcyon pileata (Boddaert)

Alcedo pileata Boddaert, Table Pl. enlum., 1783, p. 41. (China.)

English: Black-capped Kingfisher.

Japanese: Yama shobin (mountain kingfisher.)

Specimen records:

Pyongan Namdo	— 13 June 1933 (Won).
Kyonggi Do	— June, July 1887 (3) (Tacz); 10 June, July 1909 (4) (LiWM); 23 May 1912 (SSC); 1 June 1925 (SoM); 9 Oct. 1930 (Won).
Cholla Pukto	— 7 June 1933 (Won).
Kyongsang Namdo	— 25 May 1884 (USNM).

The Black-capped Kingfisher is an uncommon summer resident. Won (1934, 96) calls it rare. Y. Kuroda and Miyakoda (1919, 149) list it for Seoul from mid-May to mid-September, noting "usually found in woods of deciduous trees near a marsh or stream; nests near Seoul in Kangon Valley." Cumming says (1933, 44) these birds "are often caught during the nesting season in their deep tunnels at the end of which the nest is placed. This one is reported as nesting in colonies in high banks." Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. Taczanowski (1888, 462) says "quite common in summer, nests and leaves for winter." He describes in detail the nests and eggs found in a hole in a vertical bank, but gives neither locality nor date. Kuroda (1918, 523) purchased two eggs "collected at Seiryori, near Seoul, June 6, 1917". Yamashina has two eggs Won collected for him at Anju, Pyongan Namdo, 5 June 1932.

CORACIIDAE

207. Eurystomus orientalis abundus Ripley

Eurystomus orientalis abundus Ripley, Proc. Biol. Soc. Wash., **55**, 1942, p. 170. (Nom. nov. for *E. calonyx* Sharpe, Nanking, China.)

English: Broad-billed Roller.

Japanese: Bupposo (autochthonous, also means a Buddhist priest.)

Specimen records:

Pyongan Pukto — 26 May 1917 (3) (LiWM); 12–20 May 1929 (5) (Yam).
Hwanghae Do — no date 1919 (SoM).
Kyonggi Do — June, July 1887 (Tacz); 8, 12 June 1909 (6) (LiWM); July 1917 (Kur); 25 May 1912, 25 May 1929 (SSC); May 1926 (SoM); 10, 11, 11 July, 6 Sept. 1927 (Taka); 30 Apr. 1930 (Won).
Cholla Namdo — 22 Oct. 1928 (Uch).

The Roller is a not uncommon summer resident. Cumming (1933, 42) says "Not common in Korea, but easily recognized when seen because of its bright colors, its harsh call notes, and its peculiar habit of falling or 'rolling' in flight." Yamashina (1933, 468) estimates it as common, while Won (1934, 95) says it is rare.

There is a nest and eggs in the LiWong Museum collected in Kyonggi Do 2 July 1916. Y. Kuroda (1918, 19) mentions nestlings brought into the Seoul market for sale along with young orioles. Nishioka (1932, 198) writes "found in Korea in mid-June. I suppose it breeds near Seoul, for I saw Koreans selling young birds in the streets of Seoul." Kobayashi (1938, 187) says "In Cholla Namdo many of them use old magpie nests."

UPUPIDAE

208. Upupa epops saturata Lönnberg

Upupa epops saturata Lönnberg, Ark. Zool., **5**, 1909 (9), p. 29. (Kjachta, southern Transbaicalia.)

English: Tibetan Hoopoe.

Japanese: Yatsu gashira (derivation unclear, but yatsu means eight-headed.)

Specimen records:

Hamgyong Pukto	— 25 Apr. 1918 (Taka).
Pyongan Pukto	— 12 June 1912 (AMN); 26 May, 19 June 1917 (LiWM); Apr. (Kur); 27 May 1917 (SSC); 3 Apr.-30 May 1929 (5) (Yam).
Pyongan Namdo	— June 1931, 28 Apr. 1932, 5 June 1933 (Won); June 1934 (SSC).
Kangwon Do	— 5 Apr. 1914 (LiWM).
Kyonggi Do	— 30 June 1887 (Tacz); June 1888 (Camp); 8, 12 June 1909 (3) (LiWM); Mar. 1917 (Kur); Apr. 1931 (SoM); Oct. 1931 (Won).
Cholla Namdo	— 14 Mar. 1926, 1 Apr. 1931 (Uch).
Kyongsang Namdo	— Oct. 1912 (Kur).

The Hoopoe is a not uncommon transient throughout Korea, more plentiful in spring than in autumn, and a summer resident in the northern provinces. Taczanowski (1888, 454) says "the hoopoe is rare in Korea, but it nests there and leaves in the winter." Won (1934, 95) considers it common. Bergman (1938, 155) writes "Very characteristic of these parts [Riuganpo in Pyongan Pukto] also are the tufted hoopoes, which have their nests in hollow trees in the pine woods, and which you constantly hear uttering their peculiar cry 'up-up-up'." Hashimoto (1931, 1932) observed it at Shichihatsu Lighthouse in Cholla Namdo 2 October 1930, 1 April 1931, 15 March and 15 April 1932. He also (1937) records it from Hachibi Island in Kyonggi Do 5 and 27 April 1934. I saw a single Hoopoe on 1 April 1946, feeding on the ground near my nets in the orchard at Suwon, but it was exceedingly wild, and though I chased it over an hour, I could not get close enough to collect it.

Adachi (1941, 65) took three young from a nest in a hollow tree in Hamgyong Pukto 12 July 1940. In the Yamashina collection is a clutch of five eggs which Won collected in Pyongan Namdo 9 May 1938.

PICIDAE

209. Picus canus jessoensis Stejneger

Picus canus jessoensis Stejneger, Proc. U. S. Nat. Mus., **9**, 1886, p. 106. (Hokkaido.)

Picus canus perpallidus Stejneger, Proc. U. S. Nat. Mus., **9**, 1886, p. 107, footnote. (Sidemi, Ussuri, eastern Siberia.) (synonym?)

Geeinus canus griseoviridis Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 473. (Seoul, Korea.) (synonym.)

English: Green Woodpecker.

Japanese: Yama gera (mountain woodpecker.)

The Green Woodpeckers of Korea are very doubtfully subspecifically distinct from those of Hokkaido and of eastern Siberia. While I have an excellent series of twenty Korean specimens, I have insufficient material from Japan to allow a definite conclusion. The one Hokkaido specimen in the M.C.Z. is a decidedly lighter, yellower-green bird than any in my Korean series, which may be a seasonal, or age, if not an individual variation, and my Korean series shows much variation within itself. Yamashina is the only systematist who has had an adequate series from both localities for comparison, and he writes (1941, 500) "I think the Korean birds belong to *jessoensis*." Greenway (1940, 553) notes that the Korean series are darker and "purer green" than our inadequate Japanese material, but agrees with Hartert and Steinbacher, as well as the Japanese in synonymizing *griseoviridis*. All woodpeckers show considerable individual color variation, and in the present case all measurements overlap.

Specimen records:

Hamgyong Pukto — 7 Sept. 1917 (2) (LiWM); 1–10 Aug. (5 juv.), 3–11 Sept. (3) 1929 (Yam).

Hamgyong Namdo — 10, 26 Apr. 1884 (USNM).

Pyongan Pukto — 15 Dec. 1929 (Won).

Pyongan Namdo — 15 Sept. 1931, 4 June, 7 Sept. 1932 (Won).

Kangwon Do — 19 Sept. 1914 (LiWM); 9, 10 July 1929 (1 ad. 3 juv.) (Yam).

Kyonggi Do — 18–20 Sept. (6), 2 Oct. 1883 (USNM); Dec., Jan. 1888 (Camp); 30 Oct.-15 Dec. 1909–1914 (10) (LiWM); 22 Apr. 1917 (4), 27 Jan. 1918 (2) (Kur); 3 Feb. 1918 (4), 20 Oct., 10 Dec. (4) 1927 (Taka); 10 June 1914, 14 Dec. 1929 (SSC); Aug. 1926 (SoM); 9, 19 Nov. 1928, 5 Mar. 1929 (Won); 5 Mar.-21 Apr. 1928 (3), Feb., 15 Mar. (5) 1934, 21 Nov., 8 Dec. 1936, Jan. 1937 (3), 6–20 Apr. 1946 (6) (MCZ).

Kyongsang Namdo — 26 Apr. 1884 (USNM); 18 Dec. 1914 (LiWM).

This woodpecker is a common transient in the wooded areas of the southern half of Korea, and a few occasionally winter. The only summer records are for the mountain regions of Hamgyong Pukto and Kangwon Do where it doubtless breeds, as evidenced by the juve-

nals Orii collected. Cumming calls it (1933, 45) "well distributed over Korea but not very common anywhere. Usually seen in the deep woods but occasionally comes among the trees as open as those around the mission compounds."

I saw one near Seoul 30 November 1945, and did not observe the species again until the spring flight appeared in the forests near Suwon the first of the following April. It was common there from then until I left in May. It acts much like a Flicker, and usually feeds on or near the ground, but chooses high exposed perches on dead tree-tops as vantage points from which to shout its distinctive spring call-note.

210. Dendrocopos major japonicus (Seebohm)

Picus japonicus Seebohm, Ibis, 1883, p. 24. (Hokkaido.)
Dryobates major hondoensis Kuroda, Auk, **38**, 1921, p. 577. (Shinano, central Honshu.) (Synonym?)
Dryobates major seoulensis Kuroda and Mori, Auk, **39**, 1922, p. 364. (Seoul, Korea.) (Synonym.)

English: Pied Woodpecker.
Japanese: Aka gera (red woodpecker.)

Yamashina (1941, 510) and the 1942 Hand-List divide the Korean population of Pied Woodpeckers into two races,[1] *japonicus* breeding in Hamgyong Pukto and wintering to central Korea, and *hondoensis* occupying the area from Kyonggi Do and Kangwon Do southward as the breeding form. They consider *seoulensis* a synonym of *japonicus*. Yamashina (*idem* and 1932, 239) refers Orii's two July and two November birds, from Kangwon Do as well as his wintering specimens from Cholla Namdo, to *hondoensis*. But that the species breeds from "Seoul to Moppo" as the Hand-List claims in delineating the breeding range of *hondoensis*, is yet to be demonstrated. My series of 18 Kyonggi Do birds, all taken between December and late April, shows much individual variation, and is inseparable from the few Honshu specimens at hand. All are intermediate in belly coloring as a series between *tschcrskii*, the white-bellied northeastern Siberian form, and *cabanisi*, the brown-bellied Chinese race. While I have seen no specimens of typical *japonicus* from Hokkaido, I feel there is little justification for recognizing more than one intermediate form in the straight inter-

[1] Both follow Kuroda and Mori (1922, 365) in referring a single Seoul specimen taken 30 December 1931 to *D. m. brevirostris* (Reich.), the well-marked central Siberian form, on the basis of longer wing, heavier bill and absence of white spots on the inner secondaries. While I have not seen the specimen, I consider this practice unwarranted in so individually variable a species.

gradation between the northern and southern races. Judging from the Korean material, the split between *japonicus* and *hondoensis* is very fine indeed, and it is questionable that any of the specimens (with the exception of Yamashina's July Hamgyong Pukto and Kangwon Do birds) can be considered as breeding in the locality where collected.

Specimen records:

Hamgyong Pukto	— 21, 25 Sept. 1917 (LiWM); 24 July-2 Sept. (5 ad., 2 juv.), 24 Oct.-17 Nov. (3) 1929 (Yam).
Pyongan Namdo	— 16 June, 1 Nov. 1932 (Won).
Hwanghae Do	— 20 Mar. 1914 (LiWM).
Kangwon Do	— 8, 11 Sept. 1914 (LiWM); 15 Sept. 1920, Nov. 1927, 21 Dec. 1929 (SSC); 6, 9 July, 25, 28 Nov. 1929 (Yam); 22 Feb. 1935 (MCZ).
Kyonggi Do	— 16 Aug.-14 Oct. 1883 (10), 18 Apr. 1930, 15 Dec. 1931 (USNM); Feb. 1888 (2) (Tacz); Feb. 1910 (3), 29 Oct.-13 Jan. 1916 (9) (LiWM); 22 Apr. 1917 (4) (Kur) (type of *seoulensis*); 30 Dec. 1921 (Mori); 18 Jan. 1919, 20 Oct.-16 Dec. 1927 (7) (Taka); 24 Sept. 1929, 30 Nov. 1926 (SoM); Feb., Mar., Dec. 1934 (5), 9 Dec. 1936 (3), 5 Dec. 1945, 13 Jan. 8, 12, 27 Feb., 6 Apr. 1946 (11) (MCZ).
Chungchong Namdo	— 13 Dec. 1917 (2) (Kur).
Cholla Namdo	— 28 Feb. 1930 (Yam).
Kyongsang Namdo	— 28 Sept. 1885 (USNM).

The Pied Woodpecker is a common resident in the wooded areas of Korea. From Kyonggi Do southward it winters not uncommonly, and is at times almost abundant on migration. I found it the only common woodpecker in winter in the Seoul-Suwon area. I encountered it in the thin, scrubby, man-swept woodland patches as well as in the heavier forests. There was a marked increase in the population from mid-March through April.

It is doubtful if the species breeds in the southern provinces. The birds which winter from Kyonggi Do southward are more likely to move northward into the wooded mountainous areas to nest. There is a nest and eggs in the LiWong collection dated 23 May 1910 but without locality. Kuroda (1917, suppl.) says "this bird breeds certainly at Kwang Nung [Kyonggi Do]." Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1936. There is no other information available on its breeding in Korea, other than the juvenals collected by Orii in Hamgyong Pukto and Kangwon Do.

211. Dendrocopos minor amurensis (Buturlin)

Xylocopus minor amurensis Buturlin, Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersb., **13**, 1908, p. 243. (Amur.)

Dryobates minor nojidoensis Yamashina, Tori, **6**, no. 29, 1930, p. 254. (Nojido, Paekto-San, Hamgyong Pukto, Korea.) (Synonym.)

English: Amur Lesser Spotted Woodpecker.

Japanese: Ko-akagera (small red woodpecker.)

I have examined the male and three females in the American Museum of Natural History, and find them inseparable from a series of 16 Amur and Ussuri specimens in the Rothschild collection, all of which are darker and smaller than eight northern Siberian specimens. The white patch of the upper back varies individually, not geographically.

Specimen records:

Hamgyong Pukto — 12, 24, 29, 31 May 1912 (AMNH); 30 July-1 Sept. 1929 (11) (Yam); 31 July, 1, 7 Aug. 1929 (Won).

Hamgyong Namdo — 11 Jan. 1935 (Kyoto Univ. Coll.)

The Lesser Spotted Woodpecker is a locally common resident, confined in Korea to the high northeastern plateau.

212. Dendrocopos canicapillus doerriesi (Hargitt)

Iyngipicus doerriesi Hargitt, Ibis, 1881, p. 398. (Askold Island.)

English: Manchurian Pygmy Woodpecker.

Japanese: Amuru seguru kogera (Amur black-backed little woodpecker.)

Specimen records:

Hamgyong Pukto — 25 Sept. 1917 (LiWM); 26 July, 16, 28 Oct. 1929 (Yam).

Pyongan Namdo — 17 Oct. 1935 (Won).

Kangwon Do — 19 Sept. 1914 (3) (LiWM); 9 July 1929 (2) (Yam).

Kyonggi Do — June, Aug., Sept., 30 Oct. 1883 (9) (USNM); Dec., Feb. 1887 (Tacz); Dec., Jan. 1888-9 (3) (Camp); 30 Oct. 1910, 20 Nov., 25 Dec. 1911 (LiWM); 21 Nov. 1910, 23 Apr. 1917 (Kur); 10 Apr. 1917, 19 Nov. 1926, 5 Apr., 1 Sept. 1927 (Taka); 23 Dec. 1929 (USNM); 21 Jan., 1, 4, 5 Mar. 1929, 18 Oct., 17 Nov. 1930 (Won); Jan. 1916, 17 Oct. 1930, 31 Jan., Dec. 1934, 18–26 Apr. (7) 1946 (MCZ).

Cholla Pukto — 13 Aug. 1927 (Won).

Cholla Namdo — 24 Feb. 1930 (Yam).

Kyongsang Namdo — 10 Aug. 1927 (Won).

This woodpecker is a not uncommon summer resident; a few winter in the central and southern provinces. I encountered it only in the heavy forest just south of Suwon, where it first appeared 6 April 1946, and by the end of the month had become fairly common. While all authorities consider that it breeds in Korea, and it doubtless does so judging from the collecting dates, there are no confirmatory data.

213. Dendrocopos kizuki (Temminck)

Yungipicus kizuki nippon Kuroda, Ibis, 1922, p. 88. (Suruga, Honshu.)
Yungipicus kizuki siragiensis Momiyama, Journ. Chosen Nat. Hist. Soc., 1927, no. 4, p. 2. (Koryo, Kyonggi Do, Korea.) (synonym of *nippon*.)
Dryobates kizuki acutirostris Yamashina, Tori, 7 (32), 1931, p. 111. (Kongosan, Kangwon Do, Korea.)

English: White-backed Pygmy Woodpecker.
Japanese: Ko-gera (little woodpecker.)

This plastic species varies exceedingly throughout its range, which suggests its populations must be static in their movements, and extremely local in their distribution. The bird of western and southern Korea is indistinguishable from that of Honshu, and Momiyama's *siragiensis* has thus been discarded by all subsequent authors. The bird of eastern Korea, however, is unique in its long, thin bill, but Yamashina (1941, 548) is hardly justified in extending the range of *acutirostris* into the Ussurian region without specimen verification.

Specimen records:

Dendrocopos kizuki acutirostris:
Kangwon Do — 14 Sept. 1914 (LiWM); 13 June-4 July 1929 (9) (Yam); 8 Aug. 1930 (Won).
Dendrocopos kizuki nippon:
Kyonggi Do — 5 July, 14 Oct. 1883 (USNM); 8 Feb., 25 Oct. 1914 (LiWM); 22, 23 Apr. 1917, 23 Sept. 1923 (2), 26 Feb. 1926 (Kur); 21 Apr. 1946 (MCZ).
Chungchong Namdo — 16 Dec. 1917 (SSC).
Cholla Namdo — 24, 27 Feb. 1930 (Yam).

The Pygmy Woodpecker is an uncommon resident in the central and southern portions of Korea. Taczanowski (1888, 467) calls it "the commonest of the woodpeckers," which no one since his day has found it to be. Even Won (1934, 97) calls it rare. Y. Kuroda (1935, 88) gives a sight record from Chungchong Pukto 25 May 1931, which is possibly

referable to *Dendrocopos canicapillus*. I saw only one Pygmy Woodpecker in Korea, a single female in very worn plumage which I collected in the forest south of Suwon 21 April, during a marked flight of other woodpeckers, in which *Dendrocopos canicapillus* was the most abundant species.

214. Dendrocopos leucotos (Bechstein.)

Picus uralensis Malherbe, Monogr. Picidées, **1**, 1861, p. 92; **3**, pl. 23, figs. 4 & 5. (Ural Mountains.)

Dendrocopus leuconotus sinicus Buturlin, Mitt. Kaukas. Mus., **3** (1), 1907, p. 61. (April, 1907, Peking, China.)

Dryobates leucotos coreensis Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 472. (June 15, 1907, Fusan, Korea.) (synonym of *sinicus*.)

English: White-backed Woodpecker.

Japanese: O-akagera (large red woodpecker.)

The M.C.Z. and A.M.N.H. specimens from Hamgyong Pukto and the three M.C.Z. wintering birds from Kyonggi Do I find inseparable from a large series of *uralensis* from Amurland and Ussuri. The 1942 Hand-List follows Yamashina (1933, 518; 1941, 523) in assigning all Korean specimens except those from Hamgyong Pukto to *sinicus*. These races are not well-marked, and the dividing line between their breeding ranges is unsure. Though little is known of their seasonal movements, certainly more of the wintering birds from the central provinces should be referable to the northern race.

Specimen records:

Dendrocopos leucotos uralensis:

Hamgyong Pukto	— 14 Apr.-21 May 1912 (4) (AMNH); 25–27 Sept. 1917 (7) (LiWM); 24 July-22 Aug. (12), 3–17 Nov. (3) 1929 (Yam); 1 Aug. 1926 (Kur); 5 Aug. 1929 (2) (MCZ); 1, 5 Aug. 1929 (Won).
Kyonggi Do	— 27 Jan., 22 Feb. 1935, 9 Dec. 1936 (MCZ).

Dendrocopos leucotos sinicus:

Pyongan Namdo	— 11, 17 Oct. 1931, 7 Oct. 1935 (Won); Jan. 1936 (Taka).
Hwanghae Do	— 20 Mar. 1914 (LiWM).
Kangwon Do	— 19 Oct. 1912, 15 Sept. 1914 (LiWM); 6–16 July 1929 (4) (Yam).
Kyonggi Do	— Dec., Feb. 1887 (Tacz); 16 Feb. 1910 (2), 15 Dec. 1912 (LiWM); May, Oct. 1916 (Kur); Mar. 1916, 26 Nov. 1926, 13 Feb. 1928 (Taka); 5 Nov., 9 Dec. 1929 (Won).
Chungchong Namdo	— 12 Dec. 1917 (SSC).
Kyongsang Namdo	— 30 Sept., 3 Oct. 1885 (5) (USNM); 25 Jan. 1918 (Kur); 6 Aug. 1927 (Won).

The White-backed Woodpecker is an uncommon resident, limited to the forested areas. Taczanowski (1888, 466) found it "resident and rare." Y. Kuroda (1935, 88) gives a sight record for Chungchong Pukto 25 May 1931. The breeding populations probably move slightly southward in winter. Orii collected juvenal birds in Hamgyong Pukto, but there is no evidence of the species' breeding elsewhere in Korea other than the few summer collecting dates of adults.

215. Dendrocopos hyperythrus subrufinus (Cabanis and Heine)

Xylurgus subrufinus Cabanis and Heine, Mus. Heineanum, **4**, 1863, Heft 2, p. 50. (North China.)

English: Rufous-bellied Woodpecker.

Japanese: Chabara akagera (brown-bellied red woodpecker.)

Specimen records:

Hamgyong Pukto — 12 May-3 June 1929 (3) (Yam).
Pyongan Namdo — 6 Sept. 1933 (Won).
Kyonggi Do — 18 Oct. 1919 (Taka).

This continental species is a rare transient in northern Korea, perhaps a rare summer resident in the northwest mountains. Yamashina (1929, 169) comments on the three adults Orii collected near Paekto San that "the collector said the bird seems to breed near the collecting locality." Won (1934, 97) considers it "very rare" but claims it breeds.

216. Picoides tridactylus kurodai Yamashina

Picoides tridactylus kurodai Yamashina, Tori, **6**, 1930, p. 255. (Paekto San, Hamgyong Pukto, Korea.)

English: Korean Three-toed Woodpecker.

Japanese: Chosen miyubi gera (Korean three-toed woodpecker.)

I have compared the single specimen in the American Museum of Natural History with a series of Amurland birds in the Rothschild collection. It agrees with Yamashina's description, for it is decidedly darker, with less white above, and with heavier black stripes on the sides.

Specimen records:

Hamgyong Pukto — 10 May 1912 (AMNH); 1 Aug. 1926 (juv) (Won); 19 Aug.-2 Sept. 1929 (5) (Yam).
Hamgyong Namdo — 1 Feb. 1931 (Won); 11 Jan. 1935 (3) (Kyoto Univ.).

This very dark race is a rare resident in the northeastern highlands of Hamgyong Pukto. That it breeds there is attested by the juvenal bird Won collected (*cf.* Kuroda and Mori, 1927). It evidently moves but a short way southward in winter, and tends to be resident throughout its range.

217. Dryocopus martius martius (Linné)

Picus martius Linné, Syst. Nat., ed. 10, **1**, 1758, p. 112. (Sweden.)
Dryoscopus [sic] *martius morii* Kuroda, Auk, **38**, 1921, p. 575. (Gunpojo, Kyonggi Do, Korea.) (synonym.)

English: Great Black Woodpecker.
Japanese: Kuma gera (bear woodpecker.)

Kuroda (1921, 575) had a series of five males on which he based his description of *morii*, separating it from *silvifragus* Riley of Sakhalin and Hokkaido on the basis of a heavier bill. When they were able to examine more adequate material, the Japanese relegated both these races to synonymy under *martius*.

Specimen records:

Hamgyong Pukto	— 17–30 May 1912 (4) (AMNH); 24 July-19 Aug. 1929 (10) (Yam); 26, 29, 30, 31 July 1929 (Won); 13 Aug. 1929 (SoM).
Hamgyong Namdo	— 25 Mar. 1914 (LiWM); 3 Nov. 1931 (SSC).
Pyongan Namdo	— 15 Nov. 1932, 26 Mar. 1934 (Won).
Hwanghae Do	— Jan (Kur); 10 Nov. 1913 (SSC).
Kangwon Do	— 30 Jan. 1935 (MCZ).
Kyonggi Do	— 20 Nov. 1909, Dec. 1910, 13 Feb. 1911 (LiWM); Nov. 1913 (Kur); Nov. 1916, 21 Jan. 1928 (Taka); Sept. 1927 (SoM); 21 Dec. 1929 (Won); Feb. 1934 (2) (MCZ).

This species is a rare resident in what little heavy forest is left in Korea, and is becoming constantly rarer as the forests continue to disappear. From the collecting data, it probably breeds in the heavy, high altitude forests of Hamgyong Pukto, and moves southward to central Korea in winter. Won (1934, 97) claims it is common, and that it breeds in Hamgyong Pukto. Y. Kuroda (1935, 88) gives a sight record for Chungchong Pukto 25 May 1931. The 1942 Hand-List also assumes it breeds in Korea, but Yamashina (1941, 561) sums up the evidence, "no nests have been found in the Japanese Empire except in Sakhalin."

218. Dryocopus richardsi Tristram

Dryocopus richardsi Tristram, Proc. Zool. Soc. London, 1879, p. 386, p. 31. (Tsushima.)

Thriponax kalinowskii Taczanowski, Proc. Zool. Soc. London, 1887, p. 607. (Seoul and Songdo, Kyonggi Do, Korea.) (type in AMNH.) (synonym.)

English: Tristram's Woodpecker.

Japanese: Kitataki (tree knocker.)

Specimen records:

Hwanghae Do — Jan. (Kur).

Kyonggi Do — 28 Feb., June 1887 (Tacz); Feb. 1889 (Camp); 8, 12 June, Dec. (2) 1909, 24 Oct. 1912, 8 Feb. 1914 (LiWM); Jan., May, Dec. 1924 (Kur); 8 Dec. 1927, 23, 26 Jan. 1928, 20 Jan. 1929 (Taka); Oct. 1934, no data (2) (SoM); 9 Dec. 1929, 21 Oct. 1930 (Won); 4 Oct. 1912, 23 Feb. 1936 (SSC); 7 June 1930 (USNM); 13 Jan. 1937 (2), Dec. 1938 (MCZ).

Chungchong Pukto — 4 Dec. 1918 (Taka).

Kyongsang Namdo — Nov. 1912 (Kur); Apr. 1912 (MCZ).

This woodpecker is a rare resident in the heaviest forests of central and southern Korea, now facing extinction with the needless and ruthless wasting of the little tree cover still remaining in that over-populated land. Taczanowski's only comment other than systematic (1888, 467) was that the species was rare. Campbell, however, (1892, 242) bought a specimen in Seoul market and wrote "I observed this bird on two occasions on some hills to the southeast of Seoul at an elevation of 1600 feet. It is by no means rare. My failure to procure more than one example was due to ill luck rather than to want of opportunity." It is noteworthy that the bird has never been taken in the northern mountains, and even Won (1934, 97) collected it only at Kaesong and Pyongsan in Kyonggi Do, and notes it is "rare, breeds, but does not occur near Anju [Pyongan Namdo]." Kobayashi (1931, 77) gives a sight record for three observed 30 March 1931 in Kyonggi Do, in company with Professor Mori.

The most recent account of the status of Tristram's Woodpecker was written by Mori in his 1939 article on the need for conservation:

"This bird formerly lived in Korea and Tsushima Island. But it has died out in Tsushima, and now exists only in Korea. . . . It was first collected sixty years ago in Tsushima by Captain Richards, and the bird, a female, described by Mr. Tristram in the London Zoological Magazine. In 1891, Mr. Hatae Motokichi and Mr. Tsuchida Toshiza,

zoologists from Tokyo University, after an ardent search collected a male in Tsushima, which Professor Iijima described. Fifty years ago it was discovered that this bird also lives in Korea, through Mr. Taczanowski, a Russian, who published it in the London Zoological Magazine.

"The Kitataki is a very valuable bird scientifically. It lives only in forests where big trees thrive, for it nests in trees over two meters in circumference at the base. The nest is built in the trunk of such big trees as Chosen-momi [a fir], aka-matsu [red pine], nara gashiwa [a species of oak]. The nest opening is round or oval, about 10 centimeters in diameter; the interior is a hole 50 centimeters deep, 10 centimeters in diameter. Four eggs are laid, in May and June.

"This bird hunts worms on tree trunks as other woodpeckers do, pecking the bark with its powerful bill, and extending its barbed tongue into the insect hole. . . . The name 'Kitataki' comes from the noise of its hammering. The Koreans say it sounds like a slow "knahk knahk," and so they call the bird "knahk sae." When conditions are right, the pounding can be heard from over a mile away. But the bird is very shy, and the moment it senses the presence of an enemy, it immediately stops its hammering and hides itself.

"It is most active in the early morning, or on a cloudy day or a rainy day, flying around the forest in search of food. It seems to hide in dark places during the day, and comes out again in the evening. The food consists of various insects, usually procured by picking holes in decayed trees.

"As mentioned before, this bird is now very rare. It was collected so immoderately in Tsushima, and so many skins were exported, that it decreased very much. Finally collecting it was prohibited by law, but it was too late, and the bird is gone from Tsushima forever. It is decreasing in Korea also. It does not migrate far, but prefers to stay in the deep forests where many big trees thrive. Such localities are very limited in Korea, as there are very few such forests.

"I have both observed and collected the bird at Kwangnun in Kyonggi Do, at Pyongsan in Hwanghae Do, and at Choryong Mountain in Chungchong Pukto. Kwangnun, about 15 miles northeast of Seoul, is the site of the mausoleum of LiWong 3rd. As the surroundings of the tomb have been protected for 450 years, many big trees grew there, and many kitataki could be found. But with the recent cutting of the forest, the birds have decreased. So it is now planned to protect the Kwangnun forest by ordinance as an important habitat for the Kitataki.

"Briefly, the Kitataki is not only an interesting bird and a useful one, but it provides valuable study material from which we can infer the fact that Tsushima Island was once formerly connected with Korea in an ancient era."

219. Jynx torquilla chinensis Hesse

Jynx torquilla chinensis Hesse, Orn. Monatsb., **19**, 1911, p. 181. (China, type from Peiping.)

English: Siberian Wryneck.
Japanese: Arisui (ant-sucker.)

Specimen records:

Hamgyong Pukto — 19, 20 May 1912 (AMNH); 1 Sept. 1917 (LiWM); 9 Aug. 1929 (Won).
Pyongan Pukto — 9 Apr.-2 May 1929 (9) (Yam); 22 Apr. 1936 (Won).
Hwanghae Do — 20 May 1917 (SSC); 1 May 1918 (Taka).
Cholla Namdo — 29 Apr. 1932 (Uch).

The Wryneck is an uncommon transient, perhaps a rare summer resident in the two northern provinces of Korea. Elsewhere on the peninsula it is only of casual occurrence during the spring migration. Won (1934, 97) says it is rare, but nests in Korea. The 1942 Hand-List gives it as breeding, and Yamashina (1941, 570) says its "breeding range extends to Korea, and many pass through in spring and autumn." However, there is no breeding evidence.

PITTIDAE

220. Pitta nympha nympha Temminck and Schlegel

Pitta nympha Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1850, p. 135, suppl., pl. A. (Korea.)

English: Fairy Pitta.
Japanese: Yairocho (bird of eight colors.)

Though Temminck and Schlegel's type of this species is given as from "Corea," it may as well have come from Tsushima Island, whence there are several records, or from Quelpart Island, where the bird is a not uncommon summer resident. In Korea proper, however, the spe-

cies is but a straggler, known from three west coast records. Kuroda (1918, 530) gives Mori as his authority for the statement "this species was collected at Choen, Kokai Dist., [Changyon, Hwanghae Do] April 29, 1917." Momiyama (1929, 28) lists a second specimen, undated, taken on the Suro Islands, Cholla Namdo. Won (1932, 397) adds the third and last, at Anju, Pyongan Namdo, 15 May 1932.

Won (*idem*) proposes that the bird may migrate commonly along the outer islands of west Korea, coming north along the China coast to the Shantung peninsula, crossing the Yellow Sea to the Liaotung peninsula, and then moving southward along the outer islands to Quelpart. However, the species seems strangely limited to the south side of Quelpart. As Won points out "even on Hallasan Mountain we cannot hear it nor collect it on the north side, but always on the south side." It is thus more likely that the Quelpart colony migrates there either direct from Shanghai or else via the Ryukyus and Kyushu. The three west-Korea records are probably stragglers, off their migratory course.

Mori (1939, 9) makes a plea for protecting the breeding ground on the south slope of Mt. Hallasan, Quelpart Island, adding "Pittas migrate to Korea [Quelpart] in April every year, and lay their eggs and rear their young from May to June. The bird is very timid and solitary, taking insects hopping around on the ground. It flies straight between trees like a kingfisher. The song sounds like "kahei kahei" in the distance, but more like "kai kai" when near by. As it moves rapidly while singing, it is not easy to find . . ."

ALAUDIDAE

221. Alauda arvensis (Linné)

Alauda pekinensis Swinhoe, Proc. Zool. Soc. London, 1863, p. 89. (Peking.)
Alauda arvensis lönnbergi Hachisuka, Bull. B.O.C., **47**, 1926, p. 23. (Sakhalin.)
Alauda arvensis quelpartae Momiyama, Annot. Orn. Orient., **1** (1), 1927, p. 14. (Quelpart Island.)

English: Skylark.
Japanese: Hibari (autochthonous.)

Korean literature records several hundred specimens of Skylarks, but to assign any of these subspecifically on the basis of the various written descriptions alone is virtually impossible. The systematics and synonymy of the races as used by all but the most recent authors are so hopelessly and intricately tangled that in some cases even specific

identity is questionable.[1] Scarcely any two of the earlier authors agree as to whether a larger and darker or a smaller and lighter bird breeds or is a migrant, and some even claim two distinct subspecies breeding in the same area!

The 1942 Hand-List gives *A. a. quelpartae* as the breeding race in Korea, with *pekinensis* and *lönnbergi* occurring as migrants or winter visitors, thus largely following Yamashina's treatment of the species (1939, 474). Yamashina had an unparalleled series of Japanese, Quelpart, Korean and Manchurian specimens on which to base his conclusions. If further revision is possible, it will be only with a comparable series in addition of mainland birds covering the areas from north China through Manchuria and southeastern Siberia.

The small series I collected at Suwon falls nicely into this arrangement. Largest and darkest of all is a single male collected 14 December 1945, attributable to *pekinensis*, the wintering form. I first encountered migrant flocks in the paddies on 15 March 1946, from which I collected three males and a female, which, being intermediate in size and color, I assign to *lönnbergi*. The resident birds arrived in early April, and I collected five males actively performing their courtship song-flight on 11 April. This small series is distinctly smaller and lighter than the others, and doubtless is referable to *quelpartae*.

Inclusive collecting dates for the species from all sources are as follows:

Hamgyong Pukto	— 30 July–15 Aug.; 14 Sept.–9 Nov.
Hamgyong Namdo	— 29 April–10 May.
Pyongan Pukto	— 4–18 April.
Pyongan Namdo	— 18 Mar.–24 May.
Hwanghae Do	— 14 June–15 July.
Kangwon Do	— 30 Mar.; 16 Sept.–3 Oct.
Kyonggi Do	— 1 Feb.–13 May; 4, 5 July; 5–23 Dec.
Chungchong Do	— 8 Apr.–June.
Cholla Namdo	— 2–23 Jan.; 21–29 May.
Kyongsang Namdo	— 30 Jan.; 20 Apr.; 5–23 Dec.

Much of this material is obviously migrant or wintering rather than resident. The species winters in the paddies from Kyonggi Do southward, distributed widely in small flocks. But the winter distribution of the various races, and the respective times of their migrations, still remain to be determined. A nest and eggs in the LiWong collection from Kyonggi Do is dated 20 May 1910.

[1] This is true even of the assigned Japanese common names, which, like their American models, have usually proved more stable over the years than the binomials of the Linnaean system. "Ko-hibari," for instance, may be either a small race of skylark, or perhaps one of the short-toed species.

222. Galerida cristata coreensis Taczanowski

Galerida cristata coreensis Taczanowski, Proc. Zool. Soc. London, 1887, p. 603· (Seoul, Korea.)

English: Korean Crested Lark.
Japanese: Kammuri hibari (crested lark.)

Specimen records:

Hamgyong Pukto — 19 Aug. 1917 (LiWM); no data (SSC).
Hamgyong Namdo — 24 Apr. 1903 (2) (Roth).
Pyongan Pukto — 7–27 Apr. 1929 (11) (Yam).
Pyongan Namdo — 13–18 May 1917 (4) (LiWM); 24, 28 Apr. 1932 (Won).
Kyonggi Do — 3, 8, 10 Sept. 1883, 20 Jan. 1930 (USNM); Jan. 1886 (2) (Tacz); 8 June 1894 (AMNH); 15 Apr., 2 May 1912, 25 Dec. 1929 (SSC); 15 Dec. 1912, 17 Oct. 1914, 14 May 1916 (LiWM); 15 Dec. 1913, Nov. 1918, 13 Dec. 1923 (Kur); 20 Sept. 1926, 19, 27 Sept. 1927 (Taka); 16 Apr., 31 May 1929, Feb. 1936 (SoM); 14, 17 Oct. 1929 (Won); 12 Apr. ,28 Dec. 1934 (3), 8 Jan. (2), 24 Mar. (2), 1 May (2) 1946 (MCZ).
Chungchong Namdo — 8, 9 Apr. 1917 (3) (Kur).
Cholla Namdo — 7 Jan. 1930 (Yam).
Kyongsang Namdo — 18 Jan., 2 Oct. 1885 (USNM); 18 Dec. 1914 (LiWM).

The Crested Lark is a common resident, breeding from Kyonggi Do northward and wintering from Kyonggi Do southward. Yamashina notes (1933, 246) "while it occurs in southern Korea, it is much more common in the northern part." Cumming (1933, 22) considers it "common all over Korea, seen usually in small flocks in cultivated fields." Y. Kuroda and Miyakoda (1919) say it is a year-round resident at Seoul, where it is less common than the skylark, and add "once I saw a nest built in a cow's foot-print in Pupyong plain [Seoul]." Won sent Yamashina (unpublished ms.) a set of three eggs he collected in Pyongan Namdo 26 May 1938.

I found the bird during the winter, from December through February, scattered in twos and threes over the largest, most open paddies. In March as they started to move, small flocks were more apt to be encountered in the dry, ploughed, upland fields.

223. Calandrella cinerea puii Yamashina

Calandrella cinerea puii Yamashina, Tori, **10** (4), 1939, p. 472. (Lamagulusu, northwest Manchuria.)

English: Yamashina's Short-toed Lark.
Japanese: Karafuto ko-hibari (Sakhalin small lark.)

This species is a straggler in Korea, taken but once, a single specimen now in the Yamashina Museum, collected by Orii in Pyongan Pukto 17 April 1929. (Yamashina obtained a large series of breeding birds from western Manchuria in 1935.)

224. Calandrella rufescens cheleënsis (Swinhoe)

Alauda cheleënsis Swinhoe, Proc. Zool. Soc. London, 1871, p. 390. (Talien Bay, South Manchuria.)

English: North Chinese Sand Lark.
Japanese: Ko-hibari (small lark.)

Specimen records:

Pyongan Namdo	— 30 Apr. 1917 (Taka); 12 Feb. 1934 (Won).
Kyonggi Do	— 19 Apr. 1917 (Taka).
Chungchong Namdo	— 8 Apr. 1917 (Taka).

This species is of uncertain status in Korea. While it may be a rare summer resident in the northern provinces, it seems of little more than casual occurrence farther south in the peninsula. Yamashina states (1933, 243) that "while it has been taken a few times in Korea, its status is not clear, and it is not known to breed there." He comments later (1939, 473) "those sometimes procured in Korea are certainly a southern race, *cheleënsis*, but so far as I know they have been collected in Korea only between February and May which is not in the breeding season." The 1942 Hand-List lists the species for Korea as "(WV?)."

Perhaps referable here is a series of eight specimens in the LiWong Museum which Shimokoriyama was unable to identify and lists (1917, 45) as "?Alauda *Sp.*". I was unable to identify them positively in the hurried, chilly look I had at them in March, 1946, but they are a smaller, darker, shorter-billed and shorter-toed bird than the others in the collection, and three of them are immatures in juvenal plumage. They were collected in Hamgyong Pukto between 18 August and 9 September 1917.

[*Eremophila alpestris euroa* (Thayer and Bangs)

English: East Siberian Shore Lark.
Japanese: Hama hibari (Shore Lark)

Taka-Tsukasa and Hachisuka (1925, 901) say the East Siberian Shore Lark is not uncommon in "Corea and the Kuriles." There is no Korean record for the species. A specimen of *Galerida cristata*, an old Matsudaira skin without

further data than "Korea," now in the Uchida collection, labelled "hamu hibari" is possibly the source of the error, which fortunately has not been copied by any subsequent compilers.]

HIRUNDINIDAE

225. Hirundo rustica Linné

Hirundo gutturalis Scopoli, Del. Flor. et Faun. Insubr., **2**, 1786, p. 96. (Panay, Philippines.)

Hirundo rustica mandschurica Meise, Abh. Ber. Mus. Tierk. Volkerk., Dresden, **18**, 1934 (4), p. 46. (Charbin, Manchuria.)

English: House Swallow.

Japanese: Tsubame (autochthonous.)

Specimen records:

Hirundo rustica mandschurica:

Hamgyong Pukto — 2–4 Sept. 1917 (6) (LiWM); 17 Sept. 1929 (4) (Yam).
Pyongan Pukto — 10, 12 June (LiWM); 3 May–4 June 1929 (6) (Yam).

Hirundo rustica gutturalis:

Hamgyong Pukto — 23 Aug.–1 Sept. 1917 (5) (LiWM).
Hamgyong Namdo — 2–12 June 1912 (3) (AMNH); 5–10 May 1903 (3) (Roth).
Pyongan Pukto — 19 Apr.–4 June 1929 (11) (Yam).
Pyongan Namdo — 19 Apr., 8 June 1931 (Won); 10 Sept. 1932 (SSC).
Kangwon Do — 8 Sept. 1914 (2) (LiWM); 13 July 1929 (juv) (Yam).
Kyonggi Do — 10, 19 June, 2 Aug. 1883 (USNM); 8 June–31 July 1915 (10) LiWM); 9 July 1927 (Taka); 5 May 1928, 7 June, 26 Aug. 1930 (Won); 6 Oct. 1928 (SoM); 9 May 1934 (Uch); 14 Apr. 1946 (3) (MCZ).
Chungchong Pukto — 16 Sept. 1927 (Kur).
Cholla Namdo — 24 Mar. 1930 (Uch).
Kyongsang Namdo — 28 Apr. 1886 (USNM).

H. r. mandschurica occurs in Korea only as a migrant along the northern border. *H. r. gutturalis* is a common summer resident. Campbell (1892, 242) says "The common saying amongst Coreans is that the Swallow comes from the south on the 3rd of their 3rd month, which corresponds roughly with the middle of April, and leaves on the 9th of the 9th month, or beginning of October. These dates are not very far out." The swallows had left when I arrived in Korea in November, and I saw the first arrivals 29 March 1946, some fifteen of them

flying over the lake at Suwon. They disappeared the next day, and no more were observed until 6 April, after which they arrived in numbers. By 14 April they were common. A nest and eggs in the LiWong Museum is labelled "Kyonggi Do, 23 May 1910."

Cumming (1933, 39–40) writes "The Korean 'cheibi' has as good a reputation among the people as the sparrow has bad but in this case it is well deserved. It is undoubtedly the most valuable bird in the country. How the legend grew up that the presence of the swallow brought good luck to the home where it built its nest it would probably be very difficult to discover but since that seems to be an almost universal belief the birds are greatly welcomed and sometimes helped . . . by their host arranging a small shelf to support the heavy nest full of young . . . If by some method of transfer we could get the people to have the same regard for the birds in general that they have for the swallow it would be the best move toward bird protection that I know of. Unfortunately the general attitude is one of common indifference changing into destructiveness whenever the opportunity for nest robbing offers."

226. Hirundo daurica japonica Temminck and Schlegel

Hirundo alpestris japonica Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 33, pl. 11. (Japan.)

English: Japanese Striated Swallow; Mosque Swallow.

Japanese: Koshiaka tsubame (red-rumped swallow.)

Specimen records:

Hamgyong Pukto	— 1–4 Sept. 1917 (5) (LiWM); 25 July 1928 (Yam); 4 Aug. 1929 (Won).
Pyongan Pukto	— 10 June 1917 (LiWM).
Kangwon Do	— 22 Sept. 1914 (2) (LiWM); 13 June–14 July (9) (Yam).
Kyonggi Do	— 10 June 1887 (3) (Tacz); July 1910 (LiWM); 25 May 1912 (SSC).

This species is a locally common summer resident, usually found in the mountain areas, and seldom in the plains. Taczanowski (1888, 462) says "rare in summer, it nested in 1886, but it was not seen at all the following year." Kuroda (1917, 63) gives a sight record for thirty of them seen on the Taedong River in Pyongan Namdo 30 April 1917, and Yoshida (1923, 316) speaks of seeing them "by the ten-thousands" crowded on the wires in Hwanghae Do in mid-July, evidently gathering preparatory to migration. Won (1934, 94) calls it rare. Cumming

(1933, 41) writes "These swallows are usually found in the valleys near the higher mountains and therefor nest in the villages in such locations. 'The nest is oblong, something like a crooked bottle with a large mouth, through which it is entered. It is constructed of mud mixed with some sticks and straw, and is attached to the rafters or to any convenient surface. The eggs are similar to those of the house swallow'."

227. Delichon urbica dasypus (Bonaparte)

Chelidon dasypus Bonaparte, Consp. Av., **1**, 1850, p. 343. (Borneo.)

English: Japanese House Martin.

Japanese: Iwa tsubame (rock swallow.)

Specimen records:

Kangwon Do — 24 June–6 July 1929 (7) (Yam).

The House Martin has been recorded only from the east coast of Korea, where it is probably a locally common summer resident. Of the seven adults Orii collected in Kangwon Do (one of them is now in the M.C.Z.) Yamashina says (1931, 256) "This is not a rare bird, but I think this ls the first report of it from Korea."

In his popular account of bird conservation, Mori (1929) says the "Iwatsubame" nests on Ran Island in northeastern Hamgyong Pukto, laying from three to five eggs from the last of May to the beginning of June. This is a doubtful record, because the Japanese name may be loosely applied either to this species or to the White-rumped Swift, which, since it is well known to breed in such alcid rookeries, is probably the bird Mori referred to.

228. Riparia riparia (Linné)

Cotile sinensis (nec Gray and Hardwicke) Taczanowski, Proc. Zool. Soc. London, 1888, p. 454. (Korea.)

Clivicola riparia ijimae Lönnberg, Journ. Coll. Sci. Tokyo, **23**, 1908, art. 14, p. 38. (Sakhalin.)

Riparia riparia taczanowskii Stegmann, Compt. Rend. Acad. Sci. Russie, 1925, p. 39. (Vladivostok.)

English: Bank Swallow; Sand Martin.

Japanese: Shodo tsubame ("small-cave" or burrow swallow.)

Yamashina (1941, 420–424) refers eight Hamgyong Pukto specimens to *taczanowskii*, the Ussurian and Manchurian form (with which he had previously synonymized *stötzeriana* Meise (1939, 504)), and one Hamgyong Pukto and two Pyongan Pukto birds to *ijimae*, the northern Japan and Sakhalin race, which is slightly lighter in color and longer winged. Thus both races may occur on migration, but if breeding colonies exist in the northern provinces, they should be referable to *taczanowskii*.

Specimen records:

Hamgyong Pukto — 13–20 Sept. 1929 (9) (Yam).
Pyongan Pukto — 29 May 1929 (2) (Yam).
Kyonggi Do — 29 Sept. 1883 (USNM); 21 Sept. 1887 (2) (Tacz); 5 July 1913 (LiWM).

The Bank Swallow is an uncommon migrant in the northern provinces, rarely straying south as far as Kyonggi Do. It may perhaps be a rare and local summer resident along the northern border. Taczanowski comments (1888, 454) on the adult female and the immature Kalinowski collected at Seoul 21 Sept. 1887, "same measurements as the Sidemi birds. One meets this swallow during both migrations." Won (1934, 94) claims to have collected it in Pyongan Namdo, where he says it is common and breeds, but he mentions no confirmatory evidence, and he was unable to furnish Yamashina with data on any specimens. The July specimen in the LiWong Museum suggests there may be an as yet undiscovered breeding colony farther south. Yamashina (*idem*) says that *taczanowskii* breeds in Hamgyong Pukto, but Orii's birds, from their collection dates, were undoubtedly migrants. The 1942 Hand-List does not consider any of the evidence warrants the conclusion that the species breeds in Korea.

CAMPEPHAGIDAE

229. Pericrocotus roseus intermedius Clark

Pericrocotus cinereus intermedius Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 474. (Seoul, Korea.)

English: Korean Ashy Minivet.

Japanese: Sansho kui (eater of sansho, the Japanese pepper or prickly ash.)

Specimen records:

Pyongan Pukto — 29 Sept. 1915 (SSC); 24 Apr.–16 May 1929 (11) (Yam).
Kyonggi Do — 10 June 1883 (3) (USNM); May 1887 (2) (Tacz); 18 Apr.–8 June 1909–1914 (8) (LiWM); 4 May 1924 (Kur); Sept. 1926 (SoM); 10 Aug. 1926, 19 Apr. 1930 (Won); 9 July, 5 Sept. 1927 (Taka); 19 June 1934 (Uch).
Kyongsang Namdo — 27, 30 Apr. 1884, 3 May 1885, 25 Apr. 1886 (USNM).

The 1942 Hand-List recognizes Mori's (1929, 106) identification of a male specimen in the Seoul Scientific Museum collected by Ezo Takahashii 29 September 1915 in Yogampo, Pyongan Pukto, as *P. r. tegimae* Stejneger, the southern Kyushu and Ryukyu race. It is at best a questionable record of an improbable straggler.

The Ashy Minivet is a not uncommon spring transient, probably breeding in the northern highlands. Taczanowski (1888, 465) says it "nests in small numbers," while Campbell (1892, 239) considers it "a summer visitor on migration northward." Cumming (1933, 33) writes "small flocks of these birds may be seen on migration feeding through the trees in rather noisy indifference to human folk below. While at rest on a limb or even more in flight they repeatedly utter the rattling but somewhat musical call that easily distinguishes them . . ." Won (1934, 89) says it breeds, is common, flies in a flock. Yamashina (1933) says it breeds in north Korea. The 1942 Hand-List says it breeds. I did not encounter it.

ORIOLIDAE

230. Oriolus chinensis diffusus Sharpe

Oriolus diffusus Sharpe, Cat. Bds. Brit. Mus., **3**, 1877, p. 197. (nom. emend. for *O. indicus* Jerdon, *nec* Daudin, Malabar.)
Oriolus indicus ochroxanthus Oberholser, Proc. Biol. Soc. Wash., **38**, 1925, p. 5. (Korea.) (synonym.)

English: Black-naped Oriole.
Japanese: Wocho (yellow bird); Korai uguisu (Korean bush-warbler.)

Oberholser's *ochroxanthus* was based on Jouy's three Kyonggi Do birds, and characterized by paler color and a wider black occipital patch, which the Japanese, with larger series, consider as individual variants. Yamashina (1932, 217) notes "no distinction between those of Formosa and those of Korea in measurement or coloring."

Specimen records:

Pyongan Pukto — 23 Aug. 1912 (SSC); 6 June 1917 (2) (LiWM); 11–23 May 1929 (5) (Yam).
Kyonggi Do — 17 June, 12 Aug., 8 Sept. 1883, May 1926 (USNM); May, July 1887 (5) (Tacz); July 1889 (Camp); 8–12 June 1909 (5) (LiWM); 10 Apr., May 1926 (SoM); 11 June 1919 (Kur); 1, 4, 7, 16 Sept., 6 Oct. 1927 (Taka); 10 June 1926, 12 June 1927, 29 May 1931 (Won).
Cholla Namdo — 6 June 1930 (Uch).
Kyongsang Namdo — 11 Aug. 1927 (Won).

The Black-naped Oriole is an uncommon summer resident, perhaps more abundant in the northern provinces during migration. Cumming (1933, 16) writes "It is one of the most persecuted birds in Korea so that it is difficult to say how much of its shyness is due to the fact that its brilliant plumage and loud clear call too easily advertise its presence, though it seldom leaves the tops of the taller trees. Being an insect eater and so largely a wood bird it does not make a good cage bird but people are forever trying to catch it and no nest discovered is left unmolested. Though it does not have a great variety in its song, its clear musical quality makes it well worth hearing. . . . one of the latest comers in the spring and one of the earliest to leave."

Taczanowski (1888, 464) gives it only as a migrant, but Y. Kuroda (1918, 19) says it arrives in the Seoul region in late May and leaves in early September. He observed it in full song in Kyonggi Do from July to September, and notes that the young birds are frequently brought into the Seoul market for sale, along with those of the Broad-billed Roller. Won (1934, 80) says it is not uncommon in Pyongan Namdo, and Kuroda (1917, 69) says it arrives there "about May." Hashimoto (1932) gives its arrival at Shichihatsu Island, Cholla Namdo, 6 June 1930, 7 May 1931 and 10 May 1932. He also (1937) gives sight records for Hachibi Island, Kyonggi Do, 8 May and 16 September 1934, and 28 April 1936. In the LiWong Museum there are three sets of eggs and nests, all collected in Kyonggi Do, one dated 27 May 1910, the other two 27 June 1916.

CORVIDAE

231. Corvus corone orientalis Eversmann

Corvus orientalis Eversmann, Addenda Pallas Zoogr., fasc. 2, 1841, p. 7. (Naryn River, Buchtarma.)

English: Carrion Crow.
Japanese: Hashiboso garasu (thin-billed crow.)

Specimen records:

Hamgyong Pukto	— 14 Aug. 1917 (LiWM); 3, 21 Oct. 1929 (Yam).
Pyongan Pukto	— 15 Dec. 1912, 19 June 1917 (2) (LiWM); 10 Apr. 1929 (Yam).
Kangwon Do	— 12, 23 Sept., 2 Oct. 1914 (LiWM).
Kyonggi Do	— 8 Feb., 30 May, 31 Oct., 20 Dec. 1914, 5 July 1915, 1 Jan. 1916 (LiWM); 1 Feb. 1912 (SSC); 1 Mar. 1919, 21 Jan. 1928 (Taka); 17 Sept. 1929, 7 June 1930 (Won); 9 Feb. 1931 (SoM); 1 Jan.– 14 Feb. 1946 (7) (MCZ).
Cholla Pukto	— 31 Dec. 1911 (LiWM).
Cholla Namdo	— 6 Jan., 25 Feb. 1930 (Yam).
Kyongsang Namdo	— Feb., July, Nov., Dec. 1884 (USNM).

The Carrion Crow is a common resident in Korea. It is the common winter crow of the Kyonggi Do and southwest coastal plain areas. During severe weather it becomes amazingly tame, foraging in trash piles and dumps in close proximity to dwellings. It is wide-ranging and adaptable, finding food wherever there is any to be gleaned. While especially abundant on the outskirts of towns and near habitations where refuse is available, small bunches may always be found scattered over the frozen rice paddies, out on the coastal marshes, on the flats at low tide, in the sparsely wooded foothills, and even on the mountain tops.

While it seems ridiculous to question the fact that the species breeds in Korea, which all recent authorities accept, there is no proof of it whatever beyond the specimen collection dates. Taczanowski (1888, 459) says "observed on migration in spring, does not stay to nest." Won (1934, 79) comments briefly that it "breeds in the plains lands." Campbell (1892, 238) says it is "frequently seen in company with *C. machrorynchus*," the Thick-billed Crow, which I saw but once during my entire stay. I found the species just as abundant when I left in early May as it had been all winter, though not as tame, and scattered farther afield over the farm lands as more food became available. I noticed no signs of pairing or of courtship.

232. Corvus levaillantii mandschuricus Buturlin

Corvus macrorhynchus mandschuricus Buturlin, Mess. Orn., **4** (1), 1913, p. 40. (Ussuriland.)

English: Jungle Crow; Thick-billed Crow.

Japanese: Hashibuto garasu (thick-billed crow.)

Specimen records:

Hamgyong Pukto — 26 Apr.–15 May 1912 (5) (AMNH); 14 Aug. 1917 (LiWM); 22 Aug., 3 Oct., 28 Nov. 1929 (Yam).
Hamgyong Namdo — 1 Nov. 1931 (Won).
Kangwon Do — 1 May, 11 Sept. 1914 (LiWM); 9 Aug. 1930 (Won).
Kyonggi Do — 27 July 1883 (2) (USNM); Jan. 1887 (2) (Tacz); 10 Dec. 1910, 20 Nov. 1911 (LiWM); Jan., 20 Apr. 1928 (Kur); 21 July 1929 (Won); 15, 30 Mar. 1927, 8 Dec. 1945 (MCZ).
Kyongsang Pukto — 10 Nov. 1923 (Uch).
Kyongsang Namdo — 29 Jan. 1912 (AMNH).

The Jungle Crow is a common summer resident throughout Korea, more common, however, in the hills than it is in the plains, and an uncommon winter bird from Kyonggi Do southward. My experience with the species is at variance with that of other authors. Taczanowski (1888, 465) writes of it "Common and resident; a favorite gamebird of the Koreans, like many other birds one does not usually eat." Campbell (1892, 238) calls it "the Common Crow of Corea," and Won (1934, 79) says it is common everywhere and breeds. I collected one at Seoul 8 December 1945, the only one I observed during my entire stay. Though I shot every crow I saw with a suspiciously large bill, every one when in the hand proved to be *corone*.

As with the Carrion Crow, there are no data available on its nesting in Korea, though that it does can hardly be doubted. Y. Kuroda (1935, 519) tells of the actions of "hashibuto garasu" starting to nest in Kangwon Do in mid-May; "They fly up on the back of the ploughing bullock and pull out hair for nest-lining material, while the ploughing farmer continues smoking and pays no attention to the birds."

233. Corvus frugilegus pastinator Gould

Corvus pastinator Gould, Proc. Zool. Soc. London, 1845, p. 1. (China.)

English: Eastern Rook.
Japanese: Miyama garasu (mountain crow.)

Specimen records:

Hamgyong Pukto — 21 Oct. 1929 (Yam).
Pyongan Namdo — 8 June 1931 (Won).
Kyonggi Do — 22 Mar. 1915 (LiWM); undated (SSC); 8 Feb.–25 Mar. 1927 (7) (Taka); Nov. 1934 (Uch); 31 Jan., 23 Feb. 1930, 14 Feb. 1946 (4) (MCZ).
Chungchong Namdo — 10 Jan. 1917 (2) (LiWM).
Cholla Namdo — 1, 26 Feb. 1930 (Yam).

The Rook is a common winter visitor in the southern provinces, and a common early spring and autumn transient elsewhere. While it breeds commonly in adjoining Manchuria, it is not known to nest anywhere in Korea. Taczanowski (1888, 465) says it is "very numerous in spring, rare in autumn, absent in summer and winter." Campbell (1892, 238) writes "In the neighborhood of Söul I have observed flocks of Rooks only during the severe winter months. In large flocks I always saw numbers of a smaller and white-breasted species, which I took to be *Corvus dauricus*. I frequently tried to obtain a specimen, but was always baffled by the wariness of the bird. Both it and *Corvus pastinator* were highly suspicious of my European shooting-costume, and I always had to don a Corean robe (a white flowing garment and very conspicuous) before I could approach them."

The first flock of Rooks and Jackdaws appeared at Suwon 12 February 1946, and more appeared daily thereafter. From 15 February to 15 March they were abundant, seldom in flocks of less than 50 individuals, frequently in clouds of at least five thousand or more birds. In the mixed flocks the Rooks outnumbered the Jackdaws, usually about four or five to one. Daytimes they ranged over the thawing paddies, continually on the move, feeding as they went, and toward evening retired in droves to roost in the shelter of nearby pines. The large flocks disappeared shortly after mid-March, but scattered smaller groups, sometimes only five or six birds, remained until late April. I saw one flock of twenty birds 19 April, and the last I saw were five on the 25th.

234. Corvus monedula dauuricus Pallas

Corvus dauuricus Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 694. (Baikalia.)

English: Daurian Jackdaw.

Japanese: Kokumaru garasu (black-ball crow.)

Specimen records:

Hamgyong Pukto	— 23 Apr.–19 May 1912 (7) (AMNH); 23 Dec. 1917 (5) (Y. Kur); 21 Oct. 1929 (Yam).
Pyongan Namdo	— 5 Nov. 1930, 24 Mar. 1936 (Won).
Hwanghae Do	— 24 Mar. 1910 (2) (LiWM); 5 Mar. 1911 (Kur).
Kyonggi Do	— 22, 23 Nov. 1883 (USNM); Mar. 1887 (2) (Tacz); May 1909, Feb., 20 Dec. 1910, 25 Oct. 1914 (LiWM); 26 Jan., 22 Feb., 4 Mar. 1919. 16 Mar. 1928 (Taka); Nov. 1927 (SoM); 20 Feb. 1931 (Won); 14, 24 Feb. (3) 1946 (MCZ).

Cholla Namdo — 12 Feb. 1914 (2) (LiWM); 15 Jan. (2), 12 Feb. (5) 1927 (Taka); 25 Dec. 1929, 28 Feb., 1 Mar. 1930 (Yam).
Kyongsang Pukto — 3 May 1916 (SSC); 15 Feb. 1924 (Uch).
Kyongsang Namdo — 11 Feb. 1884 (USNM); 5 Jan. 1912, 23, 24 Dec. 1914 (4) (LiWM).

The Jackdaw is a common winter visitor in southern Korea, and an early spring and late autumn migrant elsewhere, usually found in company with the Rook. While it breeds in nearby Manchuria, it is not known definitely to nest in northern Korea. Won (1934, 79) calls it "most numerous" and says it breeds, and Adachi (1941, 11) says it nests in crevices of the cliffs near Paekto San. But the 1942 Hand-List questions the validity of their observations.

I never encountered Jackdaws singly or by themselves, but always in company with the more numerous Rooks. While on the ground the Jackdaws seem to keep by themselves in little knots of from three or four to thirty or forty birds while feeding, but in flight they mingled indiscriminately with the Rooks. The mixed flocks feed rapidly over the partly frozen, thawing rice-paddies, and when alarmed circle high in noisy confusion before departing. In one flock I observed two black-phase individuals, and three partially melanistic birds.

The Korean farmers in the Suwon area have a saying that the "kal-kamogi" always appear on the same day each year, the day after the first full moon of the first month by their lunar calendar, which is one of their many festival dates. This fell on 15 February 1946, and for once folk-lore proved fairly accurate. I saw the first Jackdaws, about forty of them in company with some two hundred Rooks, on 12 February. By the 15th there were several huge flocks of both species in the vicinity, numbering into the thousands of individuals. From then until mid-March they were abundant, but after 15 March their sudden absence from the flocks of Rooks still in the vicinity was remarkable. While smaller numbers of Rooks remained in the vicinity well into April, the last Jackdaws I saw were a knot of five with about three hundred Rooks on 20 March.

235. Pica pica (Linné)

Pica varia japonica Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1848, p. 81. (Japan.)
Pica pica jankowskii Stegmann, Ann. Mus. Zool. Ac. Sci. URSS, **28**, 1927, p. 380. (Sidemi, near Vladivostok.)

English: Korean Magpie.
Japanese: Kasasagi (autochthonous, perhaps bird of ancient times?)

The 1942 Hand-List limits *P. p. jankowskii* to the two northern provinces of Korea, Hamgyong Pukto and Pyongan Pukto, whence its range is continuous with topotypical birds from northeastern Manchuria and Ussuri. The birds of the rest of Korea are assigned to *P. p. japonica.* My series of ten Kyonggi Do specimens are separable from a large series of *sericea* from eastern China mainly by their longer tails, and from one Pyongan Pukto and three Ussurian *jankowskii* by the presence of more purple sheen in the wing and tail feathers. The northern bird likewise has an exceedingly short tail, shorter than *sericea.*

The Magpie is an abundant permanent resident throughout Korea, without question the most arrant, manifestly prominent bird in the country. There are year-round specimen records for Kyonggi Do, and the bird appears on every list from all the other provinces in which collecting has been done. It is as common in the cities and villages as it is around the rice paddies and in the fields and hills, a door-yard bird as well as one of the forests. It is apparently sedentary in its habits, and while there is some flocking in the autumn and winter, it is perhaps more for communal feeding and roosting than for any sort of migratory movement, of which there is no evidence.

The bulky nests the Magpies build, crude masses of sticks from one to three feet in diameter, are a common sight everywhere in Korea. Maniwa (1931) published a picture in "Tori" of four nests, one above the other, along the trunk of a poplar, which is not unusual. The nests increase in size annually, as they are added to during the courtship every year. Cumming (1933, 5) notes "they may be seen gathering sticks in good weather any time from mid-autumn," but I first observed them so doing during a mild spell in early February. From then on it was almost continuous, the most prominent part of the courtship. Kobayashi (1931) examined twenty nests in Hwanghae Do 26 March, of which only three contained eggs (6, 3 and 1.) As Kuroda observed (1917), the laying season is earlier in the south than in the north, and he found it more advanced when he collected eggs in Chungchong Namdo 8 April.

Taczanowski (1888, 465) says the Magpie is a "favorite food bird" of the Koreans, but I found that only the lowest class of peasants would eat them. Cumming (1933, 14) writes "Here his noisy chatter and his striking appearance make him well known all over the country. He is clever and energetic and in spite of a certain amount of fruit and grain which he takes as his right he is very valuable for the number of beetles and larger insects which he destroys. He goes after cut-

worms and grubs in freshly plowed land as our blackbirds do in the west. Unfortunately he is supposed to be very good medicine for certain ailments so that not only for his depredations is he killed." Small boys rob every magpie nest they can reach — most of them are quite difficult to climb to — because of the popular belief that eggs eaten on or near the Boys' Festival Day not only ensure good health for the coming year, but hasten puberty and enhance manly vigor.

236. Cyanopica cyanus koreensis Yamashina

Cyanopica cyana koreensis Yamashina, Tori, **10** (49), 1939, p. 457. (Moppo, Cholla Namdo, Korea.)

English: Blue Magpie.

Japanese: Koma onaga (Korean long-tail.)

The eight Hamgyong Pukto specimens in the AMNH are easily separable from a large series of Tsinling Mountain *interposita* in the Rothschild collection, being much lighter above and below. However, *C. c. koreensis* seems a very fine split on color shading alone from both *jeholica* Yamashina and *stegmanni* Meise.

Specimen records:

Hamgyong Pukto	— 19 Apr.–3 June 1912 (8) (AMNH); 25 Sept. 1917 (2) (LiWM); 22 Aug. 1912 (SSC); 30 July 1929 (Won).
Pyongan Namdo	— 3 May 1934 (Won).
Hwanghae Do	— 15 Apr. 1930 (2) (Taka).
Kyonggi Do	— Jan., Mar. 1887 (3) (Tacz); Feb., 12 June (3) 1909, Feb., 29 Nov., Dec. 1910, 15 Dec. 1912 (LiWM); 22 Apr. 1917 (4) (Kur); 8, 8, 10 Dec. 1927, 24 Jan. 1928 (Taka); Feb. 1934 (USNM).
Cholla Namdo	— 21–26 Feb. 1930 (10) (Yam).
Kyongsang Namdo	— 19 Dec. 1914 (LiWM).

The Blue Magpie is a not uncommon summer resident in the forested country of the central and northern provinces, and an uncommon winter resident in the southern part of Korea. Taczanowski (1888, 465) found it "resident and common; rare south of Seoul." Y. Kuroda (1918, 21) gives sight records for a flock of 30 in Cholla Pukto in early December, a flock of 20 in Kyonggi Do in late December and (1935, 88) in Chungchong Pukto 25 May 1931. I did not encounter it at all.

Won (1934, 80) says it "breeds in the high mountains." A nest and eggs in the LiWong collection labelled "Onagadori, Kangwon Do, 10 July 1934," is probably of this species.

237. Nucifraga caryocatactes macrorhynchus Brehm

Nucifraga macrorhynchus Brehm, Lehrb. Naturg. europ. Vog., **1**, 1823, p. 103. (northern Europe and Asia.)

English: Long-billed Nutcracker.

Japanese: Hashinaga hoshigarasu (long-billed star crow); Takegarasu (bamboo crow).

Specimen records:

Kangwon Do — 10, 11 Sept. 1914 (3) (LiWM); June (SSC); 14 Aug. 1930 (Won).

Kyonggi Do — Nov. 1887 (Tacz); 27 Sept., 25 Oct. 1914 (4) (LiWM); 14 Aug. 1930 (SoM).

Kyongsang Namdo — 23, 27 Sept. 1883 (4) (USNM); Oct. 1923 (Kur).

The Nutcracker is of uncertain status in Korea, perhaps an uncommon migrant, more likely a rare resident in the east-central highlands. Kalinowski (Taczanowski 1888, 465) twice met single birds, in the autumn. Won (1934, 80) says it is common, and that it breeds in Korea, though "confined to a narrow district." The 1942 Hand-List disregards Won's breeding hypothesis, but the general habit of the species is to breed at or above the treeline in summer, and to retreat vertically into adjacent wooded valleys in winter.

238. Garrulus glandarius brandtii Eversmann

Garrulus brandtii Eversmann, Addenda Pallas Zoogr., fasc. 3, 1842, p. 8. (Altai.)

Garrulus brandtii okai Momiyama, Journ. Chosen Nat. Hist. Soc., no. 4, 1927, p. 5. (Koryo, Kyonggi Do, Korea.) (Synonym.)

English: Brandt's Jay.

Japanese: Miyama kakesu (mountain jay.)

My three Kyonggi Do specimens are inseparable from comparable Altai and Ussuri skins. While they appear slightly darker both above and below, this is apparently due to foxing in the old skins.

Specimen records:

Hamgyong Pukto — 25 Apr. 1912 (AMNH); 22 Aug. 1912 (SSC); 26 Sept. 1917 (4) (LiWM); 9 Aug.–3 Sept. 1929 (2 ad, 2 juv.) (Yam).

Hamgyong Namdo — 20 Jan., 1 Feb. 1931 (Won).

Pyongan Pukto — 26 Nov. 1917 (Taka).

Pyongan Namdo — 19 Oct. 1933 (Won).

Kangwon Do — 22 Sept. 1914 (LiWM).

Kyonggi Do — Jan., Mar. 1887 (Tacz); 1 Feb., Dec. (2) 1910, 8 Feb., 12 June 1914, 2 Jan. 1916 (3) (LiWM); 22 Apr. 1917, 23 Apr. 1923 (Kur); 1 Oct. 1917 (SSC); 8 Oct.–27 Nov. 1927 (5) (Taka); 17 Oct. 1928 (SoM); 22 Sept.–26 Mar. 1929 (7) (Won); 4 Dec. 1929, 17 Feb. 1930, 26 Jan. 1932 (USNM); 10, 15 Apr. 1928, 20 Jan., 14 Feb. (2) 1946 (MCZ).

Kyongsang Pukto — 15 Oct. 1923, 3 Feb. 1924 (2) (Uch).

Brandt's Jay is a not uncommon permanent resident in the upland forested areas. I found it only in the neighborhood of spruces. While occasionally seen singly, in winter it is more likely to be encountered in small bands of from two to five or six roving through what forest or brush it can find on the hills. Taczanowski (1888, 465) says "common in winter, rare in summer." Y. Kuroda and Miyakoda (1918) give its season at Seoul as from November through February. Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. Won (1934, 80) says it is common and "breeds in the mountains." There are no data on its breeding in Korea, though the 1942 Hand-List assumes it does so.

PARADOXORNITHIDAE

239. Suthora webbiana fulvicauda Campbell

Suthora fulvicauda Campbell, Ibis, 1892, p. 237. (Chemulpo, Kyongii Do, Korea.) (juv.)

Suthora longicauda Campbell, Ibis, 1892, p. 237. (Seoul, Kyongii Do, Korea.) (ad. female.)

English: Crow Tit.

Japanese: Daruma enaga (long-handled doll. 'Daruma' is a round-based weighted doll which always rights itself when tipped.)

I have had no Manchurian material from which to judge the validity of *mandschurica* Taczanowski, which Yamashina (1939, 488) finds "can easily be distinguished from *S. w. fulvicauda* from central and southern Korea in their longer tail which is 67–73 mm. instead of 59.5–65 mm. as in *fulvicauda* and paler and less rusty colour of upper parts, especially that of the crown and outer webbs of the wing feathers." My series of 15 Kyonggi Do specimens I find barely separable from 4 winter *webbiana* from Anwhei and Nanking, and five winter *rosea* from northeastern Chihli. As the tails wear unevenly, varying

as much as a centimeter within the series, they are not a good criterion. The tails of my Kyonggi Do birds vary from 60 mm. to 70 mm., with one 55 mm. The Nanking series tails are 56.5, to 68.8 mm., and the Chihli birds 54 mm. to 71 mm. Nevertheless the Korean birds are distinguishable by their coloration, which is similar to though lighter than that of *webbiana*, and lacks the pinkish tinge which characterizes *rosea*. My January and February specimens show the underparts darker, especially the belly and under tail-coverts, than the April birds. At best *fulvicauda* is a rather finely-drawn race.

Specimen records:

Hamgyong Pukto —no date (SSC).
Kangwon Do —6, 22 Sept., 3 Oct. 1914 (LiWM).
Kyonggi Do —12 Aug. 1883 (3), 10 Oct. 1925 (USNM); 2-25 Dec. 1887 (3) (Tacz); Feb. (2), Aug. (2) 1889 (Camp); Feb. 1910, 26 Mar., 30 May 1914, 26 Mar., 6 Apr., 25 Dec. 1911, 11 Jan. 1914 (LiWM); 21 Jan. 1918 (Uch); 18-22 Apr. 1917 (11), 26 Feb. 1922 (2) (Kur); 21 Feb.-3 Mar. 1918 (3), 5 Dec. 1927 (4) (Taka); 5 Nov. 1924, 21 Oct. 1929 (SoM); 11 Oct. 1930 (Won); Oct. 1930 (2), Nov. 1938, 10 Jan.-18 Feb. (5), 19-26 Apr. (7) 1946 (MCZ).
Cholla Namdo —2 Apr. 1917 (Kur); 11 Dec. 1929-9 Jan. 1930 (9) Yam).
Kyongsang Namdo—30 Apr. 1884, 11 Apr. 1886 (USNM); 19 Dec. 1914 (3) (LiWM).

The Crow Tit is a not uncommon resident from Hwanghae Do and Kangwon Do southward. Taczanowski (1888, 464) calls it "resident and common." Kobayashi (1931) observed a flock of thirty in Hwanghae Do 20 March. Y. Kuroda (1935, 88) saw it in Chungchong Pukto 25 May 1931.

My own experiences with the species duplicate those of Cumming, who writes of it (1933, 30) "usually seen in small flocks of from five to fifteen or more feeding through the underbrush and in the hedges or bamboo groves. Though nervous and in continual motion they may be approached closely. They apparently have no song but are always repeating a distinctive and rather excited but not loud call. They are said to be great fighters."

Cumming also gives the only data available on the species' nesting in Korea (1933, 6), a pair which nested "two years successively in a hydrangea bush by the porch of a house in Kwangju [Cholla Namdo]. The nest is made of fine grass and rootlets."

PARIDAE

240. Parus major wladiwostokensis Kleinschmidt

Parus wladiwostokensis Kleinschmidt, Falco, **9**, 1913, p. 33. (Vladivostok.)
Parus major takahashii Momiyama, Annot. Orn. Orient., **1** (1), 1927, p. 28. (Korean peninsula. *nomen nudum.*)
Parus major takahashii Momiyama, Annot. Orn. Orient., **1** (2), 1928, p. 191. (Koryo, Kyonggi Do, Korea.) (Synonym.)

English: Vladivostok Great Tit.

Japanese: Shiju kara (means forty titmouse, but is actually a nicely alliterative imitation of the call-note, shi-ju, shi-ju.)

I can find no differences between my series of 40 Kyonggi Do specimens and a small series of Ussurian birds. Both are however, doubtdully distinct from *artatus* Thayer and Bangs of northeastern China, in being perhaps a shade darker above and below.

Specimen records:

Hamgyong Pukto —2,16 Apr. 1912 (AMNH); 23 Aug.-28 Sept. 1917 (6) (LiWM); 22 July 1929 (Won).
Hamgyong Namdo —5 May 1903 (Roth).
Pyongan Pukto —12 June 1917 (LiWM).
Kangwon Do —22 Sept. 1914 (LiWM); 15 June-9 July 1929 (3) (Yam).
Kyonggi Do —Nov., Dec. 1887 (Tacz); Apr., June 1889 (Camp); 7 May 1909, 28 Mar. (3), 12 Dec. 1911 (LiWM); Feb., 18 Apr. 1917 (7) 20 Sept. 1922 (Kur); 29 Apr. 1925 (2) (Mom); 18 Oct. 1927 (USNM); 7 Oct. 1919 (SoM); 12 Sept. 1928 -3 Apr. 1929 (6) (Won); 8 Apr., 14, 24 Oct. 1933 (Uch); 20 May 1917, 10 Nov. 1926, 10 Oct. 1927, 27 June 1928 (7), 22 Nov. 1945 -18 Apr. 1946 (33) (MCZ).
Chungchong Namdo—9 Apr. 1917 (Kur); 23 Dec. 1912, 3 Oct. 1929 (SSC).
Kyongsang Namdo —6 Apr. 1917 (Kur).

This species is a common permanent resident, the most abundant forest bird in Korea. It is a poor day's birding when you cannot find a few titmice, even in the poorest, sparsest woods. They travel through the evergreens in winter, usually in small, loosely-knit flocks, and as the days start warming up in February and March, their constant "shi-ju" is the bird note heard most frequently. Occasionally one finds travelling with them smaller numbers of Marsh Tits and Long-

tailed Tits, but the Great Tit is by far the most numerous. Taczanowski (1884,465) notes "commonest of the titmice, but rare in summer."

Despite its abundance, there is little known of its breeding in Korea. There is a nest and eggs in the LiWong Museum from Kyonggi Do, dated 23 May 1910.

241. Parus ater amurensis Buturlin

Periparus ater amurensis Buturlin, Orn. Monatsb., **15**, 1907, p. 80. (Amur, Ussuri.)

Periparus ater tyoosenensis Momiyama, Annot. Orn. Orient., **1**, no. 1, 1927, p. 31. (central Korea.) (synonym.)

English: Coal Tit.

Japanese: Hi gara (day or sun tit.)

Having seen insufficient Korean material, I can but follow the 1942 Hand-List, which assigns the Sakhalin as well as the Korean birds to this race. A small series of Ussurian birds in the M.C.Z., however, is doubtfully distinct from *P. a. ater,* and a single Sakhalin bird as well as ten specimens from northeastern Chihli are apparently inseparable from *P. a. insularis* from Hokkaido and Honshu.

Specimen records:

Hamgyong Pukto	—30 May 1912 (AMNH); 26 July-29 Aug. (1 ad., 5 juv.), 19 Oct. (2) 1929 (Yam).
Pyongan Pukto	—25 Oct. 1917 (2) (Taka).
Kangwon Do	—11 Sept.-2 Oct. 1914 (4) (LiWM); 9 July (1 ad., 2 juv.), 27 Nov. 1929 (Yam).
Kyonggi Do	—13 Oct. 1887 (Tacz); Sept., Oct. 1889 (3) (Camp); Dec. 1909, 17, 20 Dec. 1911 (LiWM); June 1917 (2), 1, 3 Oct. 3 Nov. 1926 (Taka); 4 June 1923 (Kur); Mar. 1922 (7), 12 May 1924, 29 Apr. 1925 (Mom); Oct. 1926 (SoM); 7, 20 Sept. 1929 (Won).
Chungchong Namdo	—9 Apr. 1917 (9) (Kur).
Cholla Namdo	—11 Jan. 1930 (Yam).

This species is a not uncommon summer resident; a few winter in the southern provinces. Taczanowski (1888, 455) says "sometimes very common in the conifer forests during the entire autumn, in winter and in spring; rare in summer." Y. Kuroda and Miyakoda (1918) give its season near Seoul as March and April, October and November. Kobayashi (1931) observed it in Hwanghae Do, two on 20 March and

10 on 21 March and Y. Kuroda (1935, 88) saw it in Chungchong Pukto 25 May 1931. Won (1934, 87) says it is rare, but breeds. Cumming (1933, 28) writes "It is usually seen feeding in company with others of the Chickadee family, cheerful and spry as it moves through the low trees and shrubbery in search of any kind of small insect." I did not encounter it at all.

242. Parus varius varius Temminck and Schlegel

Parus varius Temminck and Schlegel, in Siebold's Fauna. Japon., Aves, 1848, p. 71, pl. 35. (Honshu, Japan.)

Sittiparus varius koreensis Kuroda and Mori, Dobuts. Zasshi, **36**, 1924, pp. 315, 318. (Koryo, Kyonggi Do, Korea.) (Synonym)

English: Varied Tit.

Japanese: Yama gara (mountain tit.)

The 1942 Hand-List follows Yamashina (1933) in synonymizing *koreensis* as inseparable in series from specimens from the northern main islands.

Specimen records:

Pyongan Pukto	—June, 18 Oct. 1917 (Taka).
Pyongan Namdo	—June 1917 (Kur); 20 June 1917 (Taka).
Hwanghae Do	—May 1918 (Kur).
Kangwon Do	—12 Mar. 1916 (2) (Kur); 13 June-3 July 1929 (4 ad., 3 juv) (Yam).
Kyonggi Do	—10, 12 June, 21, 23 Sept., 14 Oct. 1883 (7) (USNM); 8 Feb. 1886 (3) (Tacz); 24 Mar. 1910, 6 Jan. 1912 (2), 25 Apr. 1913, 15 Feb., 4, 9, 20 July 1917 (2) (LiWM); 22 Apr. 1917, 24 Sept. 1923 (Kur); Jan. 1927, Feb. 1933 (SoM).
Cholla Namdo	—24 Apr. 1923 (Uch); 25 Feb.-3 Mar. 1929 (4) (Yam).
Kyongsang Namdo	—12, 19 Oct. 1884, 18 Apr. 1886 (7) (USNM).

The Varied Tit is a not uncommon summer resident in the forested areas; a few winter in the southern provinces. Taczanowski (1888, 464) found it "common all year." Y. Kuroda and Miyakoda's (1918) Seoul season of late April and May, late October and November, does not agree with the specimen record, but suggests the bird is perhaps more common during migration. Y. Kuroda (1935, 88) later observed it in Chungchong Pukto 25 May 1931. Won (1934, 87) calls it rare and breeding. Cumming (1933, 28) writes "found in the hills and mountains where it is fairly common throughout Korea. It is usually seen

with other members of the Chickadee family." Yamashina collected a nest and three eggs under the eaves of a temple in Kangwon Do 3 June 1936, which are now in his collection. I did not find the species during my stay in Korea.

243. PARUS ATRICAPILLUS SACHALINENSIS Lönnberg

Parus atricapillus sachalinensis Lönnberg, Journ. Coll. Sci. Imp. Univ. Tokyo, **23**, 1908, p. 20. (Sakhalin.)

English: Willow Tit.
Japanese: Ko gara (little tit.)

The Willow Tit is a straggler in Korea, known from two records. Yamashina (1929, 373) reports an adult male in his collection taken near Seoul, 10 October 1926. Mori (1935, 11) lists a specimen, without data, taken probably in January 1935, in Hamgyong Pukto by the Kyoto University Expedition.

244. PARUS PALUSTRIS Linné

Poecilia palustris crassirostris Taczanowski, Bull. Soc. Zool. France, **10**, 1885, p. 470. (Sidemi, near Vladivostok.)

Poecile communis hellmayri Bianchi, Ann. Mus. Zool. Acad. Imp. Sci. Pétersb., **7**, 1902, p. 236. (Peking.)

English: Chickadee; Marsh Tit.
Japanese: Hashibuto gara (thick-billed tit.)

My nine and Jouy's four Kyonggi Do specimens are inseparable from a series of twelve *hellmayri* from northeastern Chihli. While my fresh-killed spring birds are less rufous and darker above and below than the Chihli autumn skins, Jouy's four September birds, with an equal amount of age-foxing, are identical in color to them. They are all smaller, darker, and more rufous than a series of *crassirostris* from Ussuri. The five Hamgyong Pukto skins in the AMNH, however, agree perfectly with this larger, paler Ussurian subspecies, to which Yamashina (1939, 484) assigns Orii's large series of summer adults from the same locality. Though as Yamashina points out (1933, 375) "the dividing line between the races is unsure," it must lie somewhere between southern Hamgyong Pukto and northern Kangwon Do. While the 1942 Hand-List arbitrarily assigns *hellmayri* to all of Korea except Hamgyong Pukto, the breeding stock of Hangyong Namdo at least must be of an intergrade nature.

Specimen records:

Parus palustris crassirostris:
Hamgyong Pukto—19 Apr.-2 June 1912 (5) (AMNH); 25, 26 Sept. 1917 (4) (LiWM); 26 July 1929 (juv.) (MCZ). 24 July-1 Sept. (20), 27 Nov., 4 Dec. (3) 1929 (Yam).

Parus palustris hellmayri:
Kangwon Do —11 Sept. 1914 (LiWM); 16-30 June 1929 (3) (Yam); 7, 9 Aug. 1930 (Won).
Kyonggi Do —5 July, 21 Aug., 20, 24 Sept. 1883 (USNM); 17 Dec. 1887 (Tacz); Jan. 1889 (2) (Camp); 6 Apr. 1911 (LiWM); 22, 23 Apr. 1917 (11) (Kur); 7 Apr. 1918 (SSC); Apr. 1916 (2), 20 Nov., 3 Dec. 1926, 6, 8 Sept. 1927 (Taka); Dec. 1927 (2) (SoM); 5 Jan.- 21 Apr. 1946 (9) (MCZ).
Cholla Namdo—1 Mar. 1930 (Yam).

This Chickadee is a common resident in Korea, though neither so plentiful nor so universally distributed as *Parus major.* Cumming (1933, 27) says it is "rarer than the Common Chickadee, but often seen feeding with them in the winter time. In the summer this bird is the commonest of the Chickadees in the high mountains." Very little is known of its movements, but it probably migrates slightly southward in winter, as well as into the lowland plains areas from its higher breeding grounds in the hills.

While I observed it frequently with the other titmice (it was always third in abundance in the mixed flocks, following the Great Tit and the Long-tailed Tit) I saw it just as often in small groups by itself. There is no mistaking it for an *atricapillus* in the field, for its notes are so different. Its 'chickadee' note is coarser, shorter, neither as clear, complete nor finished, and its vocabulary lacks completely the Blackcap's spring song of "Sweet-weather." Otherwise it is just the same, tame, friendly little bird.

A nest and eggs in the LiWong Museum from Kyonggi Do was collected 20 May 1910, but how much farther south the species breeds is unknown, probably in the highlands south to the limit of the conifers.

245. Aegithalos caudatus (Linné)

Parus caudatus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 190. (Sweden.)
Acredula trivirgata magna Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 475. (Seoul, Korea.)

Aegithalos caudatus shimokoriyamae Kuroda, Auk, **40**, 1923, p. 312. (Koryo, Kyonggi Do, Korea.) (Synonym of *magnus*.)

English: Long-tailed Titmouse.
Japanese: E naga (long handle.)

The two Korean races of the Long-tailed Tit are most readily differentiated by the presence or absence of the two black crown stripes. The slightly larger northern race, *A. c. caudatus* lacks them entirely, and has the crown pure white. This is the breeding form of Hamgyong Pukto, and probably northern Pyongan Pukto and Hamgyong Namdo, nesting perhaps slightly south of the 41st parallel. The southern form, *A. c. magnus*, has the two crown stripes well developed, divided by a narrow white line in the center, and in its extreme form probably does not breed north of 38 degrees, or northern Kyonggi Do. The breeding bird of the remaining area is an intergrade, showing progressively less black on the crown and a correspondingly wider white center line as the latitude increases, and *vice versa*. The birds move irregularly southward in winter, so that while many typical striped-headed birds remain throughout the year in Kyonggi Do, occasionally pure white-headed typical *caudatus* appear as far south as Cholla Namdo.

I have examined the type of *magnus*, and find it not a young *caudatus*, as Kuroda claims (1923, 312), but an adult which, while perhaps not entirely typical, is much closer to the southern form than it is to the northern. The head-stripes are black, not brownish as in Clark's description, and, while they are not quite as wide as those in my six April Kyonggi Do birds, they are not at all like those of young *caudatus*. Neither Clark nor Kuroda described the typical extreme southern breeding bird. Both types were collected in mid-October, within a few miles of one another; both are undoubtedly migrants which bred somewhere in the intergrade zone of Hwanghae Do or Pyongan Namdo. But as Kyonggi Do is well within the breeding range of the southern form, Clark's name is available for it, and *shimokoriyamae* becomes a synonym.

Specimen records:

Aegithalos caudatus caudatus:

Hamgyong Pukto—7 Nov. 1917 (SSC); 26 July-3 Sept. (4 ad, 1 juv) (Yam); 1 Feb. 1931 (Won).
Pyongan Pukto —20 Oct. 1933 (Won).
Kyonggi Do —14, 24 Oct. 1883 (3) (USNM); 20 Dec. 1911 (LiWM); 2 Nov. 1922 (Kur); 15 Nov. 1925 (SSC); 23 Oct. 1926, 21 Feb. 1930 (MCZ).
Cholla Namdo —27 Jan. 1930 (2) (Yam).

Aegithalos caudatus magnus:
Kangwon Do —9 Sept. 1914 (LiWM).
Kyonggi Do —24 Oct. 1883 (USNM); Oct., Dec. 1889 (5) (Camp); 17 Dec. 1911, 15 Feb. 1914, 19 July 1917 (LiWM); 3 Feb. 1918, 19 Nov., 2 Dec. 1926 (Taka); 22 Apr. (2), 15 Oct. 1917 (Kur); 25, 26 Oct. 1929, 12 Feb. 1930 (Won); Nov., Dec. 1938, 1-29 Dec. 1945 (4). 10-24 Apr. 1946 (6) (MCZ).

The Long-tailed Tit is a common resident, second in numbers only to the Great Tit among the Paridae. Taczanowski (1888, 464) termed *trivirgatus*, a dark-headed form "resident, commonest near Wonsan". Campbell (1892, 236) referred his specimens to *caudata* and wrote "On the two or three occasions that I observed Long-tailed Tits in Corea, they travelled in bands of a dozen or so, flitting continuously from tree to tree and keeping up an incessant and distinctive harsh chirping note." Cumming (1933, 29) says "Seen feeding in small flocks through the treetops, nervous and always on the move. It is not however particularly shy and may be followed for close observation. Its oft repeated call is not as loud nor varied as that of the Common Chickadee with which it is most often seen."

A nest and eggs in the LiWong Museum from Kyonggi Do is dated 25 May 1910.

246. Remiz pendulinus consobrinus (Swinhoe)

Aegithalus consobrinus Swinhoe, Proc. Zool. Soc. London, 1870, p. 133. (Yangtsekiang, China.)
Remiz consobrinus suffusus Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 474. (Fusan, Kyongsang Namdo, Korea.) (Synonym.)

English: Penduline Tit.
Japanese: Suin-ho gara (Swinhoe's tit.)

Specimen records:

Hamgyong Pukto —18 Apr. 1918 (2) (Taka).
Pyongan Pukto —25 Apr.-2 May 1929 (8) (Yam).
Pyongan Namdo —13 May 1917 (3) (LiWM); 15 May 1917 (SSC); 20 Apr. 1918 (Taka).
Kyonggi Do —3 Feb. 1918 (Taka).
Kyongsang Namdo—21 Dec. 1884 (2) (USNM).

The Penduline Tit's main migration route is along the continental mainland. It is a fairly common spring migrant in the northern provinces, and straggles occasionally in winter to the southern part of the peninsula.

SITTIDAE

247. Sitta europaea (Linné)

Sitta amurensis Swinhoe, Proc. Zool. Soc. London, 1871, p. 350. (Amur.)
Sitta europaea hondoensis Buturlin, Trav. Soc. Nat. Petrograd, **44**, 1916, p. 171. (Honshu, Japan.)
Sitta europaea buturlini Momiyama, Kaidori, **2**, 1931 (8), pp. 4, 22, fig. 1. (Mts. of Korea.) (*nomen nudum.*)

English: Eurasian Nuthatch.

Japanese: Goju kara (perhaps from the note, but means fifty tit); Ki mahari (tree spirit-needle, not commonly used.)

Yamashina (1932, 227) found his series of thirteen summer Hamgyong Pukto and nine central and southern Korean specimens identical with the breeding form of Honshu, while two birds collected by Orii in Hamgyong Pukto in October are definitely lighter-bellied, and hence assignable to *amurensis.* Taczanowski (1888, 463) says his two January Kyonggi Do specimens "agree perfectly with birds from Amur and Ussuri", while Campbell (1892, 236) judged his March skins to "show, perhaps, more chestnut on the breast and belly than birds from Ussuri". My single spring Nuthatch is pale, with less chestnut on the underparts than two autumn specimens in the MCZ and the seven Hamgyong Pukto birds in the AMNH, which, like the Honshu specimens, are darker below than the Amur series. Size is not a criterion, and the two races are a fairly fine split, based on shading of the underparts.

Specimen records:

Sitta europaea amurensis:

Hamgyong Pukto—11, 19 Oct. 1929 (Yam).
Kyonggi Do —Jan. 1887 (2) (Tacz); 13, 17 Dec. 1911, 15 Feb. 1914 (LiWM); 21 Apr. 1946 (MCZ).

Sitta europaea hondoensis:

Hamgyong Pukto—21 Apr.-18 May 1912 (7) (AMNH); 4, 16, 25 Sept. 1917 (7) (LiWM); 25 July-1 Sept. (10 ad., 2 juv.) (Yam); 27 July, 1 Aug. 1929 (Won).
Pyongan Pukto —2 Oct. 1917 (MCZ); Oct. 1917 (3) (Taka).
Pyongan Namdo —24 Oct. 1932 (Won).
Kangwon Do —10, 14 Sept. 1914 (3) (LiWM); 20 June-12 July 1929 (6 ad., 4 juv.) (Yam); 5, 8 Aug. 1930 (Won).
Kyonggi Do —Mar. 1889 (2) (Camp); 25, 28 Apr. 1913 (LiWM); 23 Apr. 1917 (2), 24 Sept. 1923 (Kur); 6 Nov. 1926 (6) (Taka); 6, 7 Nov. 1926 (4) (Yam); 21 Oct. 1928 (SoM); 10 Oct. (2), 20 Sept. 1929 (Won); Nov. 1938 (2) (MCZ).

The Eurasian Nuthatch is not uncommon in Korea, *hondoensis* as the resident race, breeding in the northern and central highlands and wintering slightly southward, and *amurensis* a winter visitor as far south as Kyonggi Do. Both Campbell and Taczanowski mention it as only a winter bird near Seoul, and Y. Kuroda and Miyakoda (1919) give its season there as from November through February. Won (1934, 86) claims it breeds in both Hamgyong Pukto and Kyonggi Do.

248. Sitta canadensis Linné

Sitta villosa Verreaux, Nouv. Arch. Mus. Paris, **1**, 1865, Bull., p. 78, pl. 5, fig. 1. (China, north of Peking.)

Sitta corea Ogilvie-Grant, Bull. B. O. C., **16**, 1906, p. 87. (110 miles southeast of Seoul, Korea [probably at Mungchong, Chungchong Pukto.])

Sitta villosa yamashinai Momiyama, Kaidori, **2**, 1931 (8), pp. 5, 24. (Hamgyong Pukto, Korea.) (*nomen nudum.*)

English: Grey Nuthatch.

Japanese: Chosen goju kara (Korean nuthatch.)

The 1942 Hand-List follows Yamashina (1933, 353, 355) who assigns the Hamgyong Pukto specimens to *S. c. villosa*, and those of the remainder of Korea to *S. c. corea*. Ogilvie-Grant's *corea* is described as being smaller than *villosa*, and with no rufous on the breast and belly, in which characters the two winter Kyonggi Do skins in the MCZ agree.

Specimen records:

Sitta canadensis villosa:

Hamgyong Pukto—30 July-29 Aug. 1929 (5) (Yam); 10 Aug. 1929 (Won); no data (Mom).

Sitta canadensis corea:

Pyongan Pukto —20 Oct. 1933 (Won).

Kyonggi Do —19 July 1917 (LiWM); 10 Oct. 1917 (SSC); 7 Dec. 1917 (2), 20 Oct. 1926 (Taka); 15 Mar. 1924 (Kur); Nov., Dec. 1938 (MCZ).

Kyongsang Pukto—30 Nov. 1905 (Ogilvie Grant.)

The Grey Nuthatch is an uncommon resident in Korea, probably limited to the conifer forests in the highlands. Cumming (1933, 26) says "hills and mountains of Korea." Won (1934) says it is rare but breeds. There is no other information available on its status in Korea, beyond that afforded by the few specimens that have been taken.

CERTHIIDAE

249. Certhia familiaris familiaris Linné

Certhia familiaris Linné, Syst. Nat., ed. 10, **1**, 1758, p. 118. (Sweden.)
Certhia familiaris kawamurai Momiyama, Annot. Orn. Orient., **1** (1), 1927, p. 22. (Seoul, Korea.) (Synonym.)

English: Common Tree Creeper.
Japanese: Kita kibashiri (northern tree-runner.)

Specimen records:

Hamgyong Pukto —11 May-2 June 1912 (3) (AMNH); 22-26 Oct. 1929 (10) (Yam).
Pyongan Pukto —July 1917 (2) (Taka).
Pyongan Namdo —31 Nov. 1932 (Won).
Kyonggi Do —5 Nov. 1883 (USNM); Dec., Jan. 1889 (Camp); Nov. 1916 (Taka); Dec. 1909, 24 Mar. 1910 (2), 17 Dec. 1911, 29 Oct. 1914 (LiWM); Dec. 1925, 1 Oct.-1 Nov. 1929 (5) (Mom); Nov. 1926 (SoM); 10 May 1916 (Kyoto Mus.); 9 Mar., 9 Nov. 1929, 6 Feb., 10 Mar. 1930, 19 Jan., 19 Feb. 1931 (Won); 28 Dec. 1929 (SSC); 4 Nov. 1935 (Uch).
Kyongsang Namdo—15 Nov. 1884 (USNM); 19 Dec. 1914 (LiWM).

From the record the Tree Creeper is a not uncommon transient throughout Korea, with a few occasionally wintering in the southern provinces. Taczanowski (1888, 463) says it is "common in winter". Campbell (1892, 236) "observed the Common Creeper only in winter, when it was fairly plentiful. Cumming (1933, 26) notes you "usually see it in the winter feeding with the chickadees". Won (1934, 86) on the other hand, calls it rare. I did not find it at all.

TIMALIIDAE

250. Rhopophilus pekinensis pekinensis (Swinhoe)

Drymœca pekinensis Swinhoe, Ibis, 1868, p. 62. (Peking, China.)

English: Chinese Babbler.
Japanese: Kara chimedori (Kara is ancient China; chimedori is any timaline bird.)

Specimen records:

Hamgyong Pukto—21 Sept. 1912 (SSC).
Pyongan Pukto —3 Jan. 1928 (Won).
Pyongan Namdo —17 Apr., 18 Nov. 1931, 9 July 1932 (Won); 25 June 1932 (Kur).
Hwanghae Do —3 Mar. 1914 (2) (LiWM); 1 Jan. 1919 (Kur); Mar. 1926, 5 July 1928 (Won).
Kyonggi Do —5 July 1928 (SoM).

The Chinese Babbler is a rare visitor to Korea, of uncertain status. Won (1934, 92) states that it is common and breeds, but the Japanese have not accepted his opinion. The 1942 Hand-List regards the species as a straggler.

BRACHYPODIDAE

251. Microscelis amaurotis hensoni (Stejneger)

Hypsipetes amaurotis hensoni Stejneger, Proc. U. S. Nat. Mus., **15**, 1893, p. 347. (Hokkaido.)

Microscelis amaurotis coreensis Momiyama, Bull. Biogeogr. Soc. Jap., **2** (3), 1932, p. 315. (*nomen nudum.*)

English: Henson's Brown-eared Bulbul.
Japanese: Hiyodori (autochthonous.)

Specimen records:

Kyonggi Do —Dec., Jan., Feb. 1887 (10) (Tacz); Nov. 1909, 29 Nov. 1910, 8 Feb. 1914, 2 Jan. 1916 (LiWM); 17 Oct. 1918, 8 Nov. 1927 (Taka); 10 Jan. 1923 (Mom); 6 Feb., 9 Mar., 9 Apr. 1929, 9 Jan., 9 Apr., 25 Dec. 1930, 19, 23 Jan. 1931 (Won); 10 Feb. 1930, 22 Feb. 1932 (SoM); 26 Jan.-24 Apr. 1946 (7) (MCZ).
Chungchong Namdo—12 Dec. 1917 (2) (SSC).
Cholla Namdo —19 Feb. 1914 (LiWM); 18 Dec. 1929 -26 Feb. 1930 (11) (Yam).
Kyongsang Namdo —30 Nov. 1883 (USNM).

The Brown-eared Bulbul is a not uncommon winter visitor to the southern half of Korea, from Kyonggi Do southward. It is a noisy, active bird of the open woodlands, feeding through the thin forests in small bands of from two to five individuals. Its call note has a distinct thrush-like quality, and its burbling song is one of the few bird melodies you hear in winter. Taczanowski (1888, 464) says "in the winter of 1886-7 it was common around Seoul and fed on the junipers, the next winter it was completely absent." Y. Kuroda (1935, 88) observed it in

Chungchong Pukto 25 May 1931. I found Bulbuls around the evergreens in the palace grounds at Seoul every time I went there between December and April, and encountered it in the brush and woodlands at the heads of the valleys around Suwon from January until the end of April.

CINCLIDAE

252. Cinclus pallasii hondoensis Momiyama

Cinclus pallasii hondoensis Momiyama, Annot. Orn. Orient., **1** (1), 1927, p. 52. (Shimotsuke, Honshu.)

English: Pale Pallas' Dipper.
Japanese: Kawa garasu (river crow.)

Specimen records:

Hamgyong Pukto —15 Aug. 1917 (LiWM).
Hamgyong Namdo—Mar., Dec. 1887 (3) (Tacz); 26 Mar. 1914 (LiWM).
Pyongan Pukto —29 Dec. 1927 (SoM); 22 Jan. 1938 (Won).
Kangwon Do —2 July, 2 Dec. 1929 (Yam).
Kyonggi Do —9 Feb. 1889 (Camp); 10 Mar. 1911, 5 Feb., 21 Nov. 1912 (LiWM); Jan. 1918, 10 Feb. 1923 (Kur); 18 Aug. 1920 (SSC); 2 Dec. 1938, 20 Nov. 1939 (MCZ).
Cholla Pukto —Dec. 1918 (Y. Kur).
Kyongsang Namdo—18 Jan. 1912 (LiWM).

The Dipper is a not uncommon resident in the highlands throughout Korea, on fast-running mountain streams. Taczanowski (1888, 463) says "common in winter, but one does not begin to meet it until sixty kilometers north of Seoul, from where one finds it up to the Russian frontier." Campbell (1892, 21) observed Dippers in the mountains of Hamgyong Pukto and Kangwon Do in September. Won (1934, 94) calls it common and breeding. Y. Kuroda (1935, 88) found it in Chungchong Pukto 25 May 1931. There are no data on its nesting in Korea.

TROGLODYTIDAE

253. Troglodytes troglodytes peninsulae (Clark)

Olbiorchilus fumigatus peninsulae Clark, Proc. U. S. Nat. Mus., **32**, 1907, p. 474. (Fusan, Kyongsang Namdo, Korea.)

English: Korean Wren.
Japanese: Misosazai (autochthonous.)

The breeding place of this distinct dark race has yet to be demonstrated. Southern Korea, though the type locality, is unquestionably only its wintering ground. While it may possibly breed in secluded, high mountain valleys in Korea, it seems improbable, for there are no Korean records later than April (other than a sight record by Y. Kuroda (1935, 88) for Chungchong Pukto 25 May 1931) nor earlier than October. There is a specimen in the M.C.Z. identical with the Korean skins, taken in Vladivostok 8 December 1884. Summer specimens from eastern Manchuria and southeastern Siberia might answer the question.

Specimen records:

Hamgyong Pukto —21, 22 Oct. 1929 (Yam).
Pyongan Namdo —Jan. 1936 (Taka).
Hwanghae Do —Feb. 1926 (SoM).
Kangwon Do —26 Nov., 2 Dec. 1929 (Yam).
Kyonggi Do —Dec., Jan. 1886-7 (5) (Tacz); 20 Jan. 1889 (Camp); Nov., Dec. 1909, 28 Mar., 5 Apr. (5) 1911 (LiWM); Feb. 1916, Oct. 1917, 20 Nov. 1926, 26 Dec. 1927 (Taka); 9 Mar. 1923, 26 Feb. 1926 (2) (Kur); 31 Oct. 1926, 29 Dec. 1929, 5 Jan. 1931 (Won); 1 Dec. 1929 (SoM); 26 Apr. 1936 (Uch); 20 Dec. 1927, 2 Dec. 1938, 6 Jan., 9, 19 Mar., 6 Apr. 1946 (MCZ).
Cholla Namdo —13, 27 Dec. 1929 (Yam).
Kyongsang Namdo—4 Dec. 1884, 14 Dec. 1885 (USNM).

This species is a not uncommon winter visitor in Korea. Both Taczanowski (1888) and Campbell (1892) list it as resident, but their only specimens are December and January. Y. Kuroda and Miyakoda (1919) give its season in Seoul as from November through February. Hashimoto (1932) saw it a number of times at Shichihatsu Island, Cholla Namdo, between 28 October 1930 and 23 April 1932, and again (1937) at Hachibi Island in Kyonggi Do, where his earliest autumn records are 20 October 1933 and 22 October 1936, and his latest spring dates 27 April 1934 and 21 April 1936. Won (1934, 94) says it is common and that it breeds, to which Yamashina and the 1942 Hand-List agree, but the evidence does not support the claim.

Cumming (1933, 39) gives the following accurate first-hand summation: "This bird probably breeds in Siberia, for it is only seen in Korea after the cold weather comes and is not reported elsewhere in the Japanese Empire. It is rarely seen then except solitary, feeding along in the brush and grass of some stream side or around the fences of the Korean homes. It often takes refuge in the chimneys or underground

flues from which it has received its Korean name [Kultuk-sai, meaning chimney-bird]. It is fussy and nervous like its western kin."

I observed only eight individuals between 26 November 1945 and 6 April 1946, of which I was able to collect four. I found the bird extremely shy, and adept at concealing itself when flushed. It loves to scoot in under the roots of fallen trees and beneath the overhanging banks of streams and eroded gullies. Its small size lends it a maddening propensity for slipping through the shot-pattern.

TURDIDAE

254. Turdus aureus aureus Holandre

Turdus aureus Holandre, Faune dep. Moselle, in Ann. Mos., 1825, p. 60. (Metz.)

English: White's Ground Thrush.
Japanese: Tora tsugumi (tiger thrush.)

Specimen records:

Pyongan Pukto —26 Apr.-6 May 1929 (3) (Yam).
Pyongan Namdo —20 Apr. 1918 (Taka).
Kangwon Do —23 Sept. 1914 (LiWM).
Kyonggi Do —Apr., May 1887 (Tacz); 22 Apr. 1909, 13 May 1910 (4) (LiWM); 18 Apr. 1914 (SSC); 10 Sept. 1923, 12 Apr. 1928 (SoM); 12, 21 Apr. 1928 (Won); 11, 23 Apr. 1946 (MCZ).
Cholla Namdo —2 Apr. 1924, 22, 26 Oct. 1928, 10 Apr. 1931 (Uch).
Kyongsang Namdo—22 Apr. 1886 (USNM).

This handsome thrush is a not uncommon migrant in Korea, seemingly more plentiful in spring than in autumn. Taczanowski (1888, 463) met it only in spring. Y. Kuroda and Miyakoda (1919) list it as occurring near Seoul in May only. Won (1934, 92) says it is uncommon, but that it breeds, in which both Yamashina (1941, 199) and the 1942 Hand-List concur. But in view of the specimen record, and the paucity of any other information, the species can only be regarded as a transient.

255. Turdus sibiricus sibiricus Pallas

Turdus sibiricus Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 694. (Dauria.)

English: Siberian Ground Thrush.
Japanese: Shiberiya mamijiro (Siberian white-eyebrow.)

(The 1942 Hand-List gives the Japanese race, *T.s. davisoni* (Hume) as a straggler in Korea. The four specimens from Cholla Namdo in the Uchida collection were originally identified as *davisoni,* but the only one of them still in existence I found to be *sibiricus.* Neither of the other two specimens assigned to *davisoni* (Mori's Pyongan Pukto specimen in the SSC, and Won's Kyonggi Do bird in the SoM) is available for verification of subspecific identification, but it is doubtful if either was ever compared with specimen material of both races.)

Specimen records:

Pyongan Pukto —26 May 1917 (3) (LiWM); 27 May 1917 (SSC); 16-20 May 1929 (10) (Yam).
Kyonggi Do —20 June 1909 (2) (LiWM); undated (2) (Kur); 19 May 1926 (SoM).
Cholla Namdo —20 Sept. 1924, 23 Sept. 1928, 19 Oct. 1930, 17 Sept. 1931 (Uch).
Kyongsang Namdo—7 May 1884, 23 Sept. 1885 (USNM).

This thrush is a common spring migrant along the northern border, following the mainland migration route. It is less common during both spring and autumn flights in the southern part of the peninsula.

256. Turdus cardis cardis Temminck

Turdus cardis Temminck, Pl. Col., livr. 87, 1831, pl. 518. (Japan.)
English: Japanese Grey Thrush.
Japanese: Kuro tsugumi (black thrush.)

This species is a straggler to southern Korea from the Japanese main islands. There are three specimens on record. Jouy collected a female 25 April 1884 and a young male 26 April 1886 at Fusan, Kyongsang Namdo. The third was taken in Cholla Namdo 6 September 1923 and is now in the Uchida collection. Mori (1917, 73) claims to have collected one in Pyongan Pukto during May or June 1917, but there is no such specimen in any of the subsequent lists.

257. Turdus hortulorum Sclater

Turdus hortulorum Sclater, Ibis, 1863, p. 196. (Amoy, China.)
English: Grey-backed Thrush.
Japanese: Kara akahara (Chinese red-belly.)

Specimen records:

Hamgyong Pukto —28 Sept. 1917 (LiWM).
Pyongan Pukto —3 Apr.-4 May 1929 (10) (Yam).
Pyongan Namdo —20 Apr. 1918 (2) (Taka); 24 Apr. 10 Oct. 1931, 27 May 1932, 22 June 1933 (Won).
Hwanghae Do —7 May 1917 (SSC).
Kyonggi Do —21 Apr. 1911 (2) (LiWM); Apr. 1916 (Kur); 15, 16 Oct. 1927 (3) (Taka); 23 Apr. 1929 (SoM); 22 Apr. 1946 (2) (MCZ).
Chungchong Namdo—June (Kur).
Cholla Namdo —20 Nov. 1924, 25 Apr. 1932 (Uch).

The Grey-backed Thrush is a not uncommon transient, more plentiful apparently in the north near the mainland flight route than in the southern end of the peninsula, and in spring than in autumn. I collected the only two I encountered, in fairly heavy forest near Suwon, 22 April.

258. Turdus pallidus Gmelin

Turdus pallidus Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 815. (Lake Baikal.)

English: Pale Ouzel.
Japanese: Shirohara (white belly.)

Specimen records:

Pyongan Pukto —27-30 Apr. 1929 (3) (Yam).
Pyongan Namdo —21 July 1934, 6 May 1936 (Won).
Kyonggi Do —Spring 1887 (Tacz); 22 Apr. 1911 (LiWM); 20 Apr. 1917 (Kur); 24 Apr. 1929 (SoM).
Cholla Namdo —22 Nov. 1928, 30 Oct. 1930 (Uch).
Kyongsang Namdo—25-29 Apr. 1884 (5) (USNM).

The Pale Ouzel is an uncommon spring and autumn transient. Taczanowski (1888, 454) says "one sees it only during the two migration periods". Won (1934) considers it uncommon. It is noteworthy that all the specimen records, except those of Uchida from Cholla Namdo, are during the spring migration.

259. Turdus obscurus obscurus Gmelin

Turdus obscurus Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 816. (Lake Baikal.)

English: Grey-headed Thrush.
Japanese: Mamichajinai (autochthonous; mamicha is brown-eyebrow, jinai perhaps a bird name of uncertain derivation.)

Specimen records:

Pyongan Pukto —26 May 1917 (2) (LiWM); 11-19 May 1929 (9) (Yam).
Kyonggi Do —21 May 1887 (2) (Tacz); May 1889 (Camp); 16 Nov. 1914 (LiWM); Apr. (Kur); undated (SSC).
Cholla Namdo —6 Nov. 1923, 8 Dec. 1927, 7, 11 May, 12 Nov. 1931 (Uch).
Kyongsang Namdo—3 May 1884 (USNM).

The Grey-headed Thrush is a not uncommon transient, seemingly more plentiful in the northern provinces than it is farther south. Taczanowski (1888, 454) calls it a "bird of passage on both migrations." Campbell (1892) gives a sight record for Hamgyong Pukto, 4 October 1889. Won never collected it.

260. Turdus chrysolaus chrysolaus Temminck

Turdus chrysolaus Temminck, Pl. Col., livr. 87, 1831, pl. 537. (Japan.)
English: Japanese Brown Thrush.
Japanese: O-akahara (large red-belly.)

Specimen records:

Pyongan Namdo —27 May 1931 (Won).
Cholla Namdo —20 June 1929, 25 Apr. 1932 (Uch).
Kyongsang Namdo—3, 7 May 1884 (USNM).

The Japanese Brown Thrush is little more than a straggler to southern Korea from the main islands. Kuroda (1917, 55) lists an April record for Chongyon-ri near Seoul without source or details, which he does not repeat in his English (1918) version, and there is no such specimen on record. Y. Kuroda and Miyakoda (1919) say "a very few can be found in the hunting season but not in spring" and list it for October only in the Seoul region. Won (1934, 92) says "rare, transient in spring and autumn."

261. Turdus naumanni Temminck

Turdus naumanni Temminck, Man. d'Orn., **1**, 1820, p. 170. (eastern Asia.)
Turdus eunomus Temminck, Pl. Col., livr. 87, 1831, pl. 514. (Japan.)
English: Naumann's Thrush, Dusky Thrush.
Japanese: Tsugumi (autochthonous for *T. n. eunomus*); Hachijo tsugumi (Hachijo thrush, for *T. n. naumanni.*)

While these are two very different looking birds, they intergrade to such an extent that they are now considered only subspecifically distinct. Their breeding ranges are given as across central Siberia, from the Yenissei eastward, *T. n. eunomus* north to the tree line, and *T. n. naumanni* to the southward. Both mingle on migration, but *eunomus* travels farther to the eastward and southward, occurring in Korea only as a migrant. The common wintering form is *naumanni*.

Specimen records:

Turdus naumanni naumanni:

Hamgyong Pukto —21 Apr. 1912 (AMNH).
Pyongan Pukto —4-28 Apr. 1929 (9) (Yam).
Pyongan Namdo —19, 26 Jan., 17 Mar. 1931, 31 Apr. 1932 (Won).
Kyonggi Do —Jan., Feb. 1887 (4) (Tacz); winter 1889 (3) (Camp); Feb. 1910, 2 Apr., 24 Dec. 1911, 2 Jan. 1916 (LiWM); 20 Apr. 1917 (2) (Kur); 2 Mar., 2 Apr. 1917, 27 Feb., 5, 6, 14 Mar. 1927 (Taka); 2 May 1918, 24 Dec. 1929, 12 Feb. 1931 (SSC); 5, 15 Mar. 1929, 17 Mar. 1930 (Won); 8 Apr. 1930, 16 Apr. 1931 (SoM); 30 Mar. 1936 (Uch); 22 Nov. 1945-14 Apr. 1946 (20) (MCZ).
Chungchong Namdo—8 Apr. 1917 (2) (Kur).
Cholla Namdo —1-25 Jan. 1930 (3) (Yam); 15 Mar. 1927 (Taka); 21 May 1928 (Uch).
Kyongsang Namdo —3 Jan. 1886 (USNM).

Turdus naumanni eunomus:

Hamgyong Pukto —21 Apr. 1912 (AMNH); 25 Apr. 1918 (Taka).
Pyongan Pukto —26 May 1917 (LiWM); 4 Apr.-21 May 1929 (11) (Yam); 25 Apr. 1935 (SSC).
Pyongan Namdo —3 May 1917 (Kur); 14 May 1917 (LiWM); 27 Apr. 1931, 21 Apr.; 31 Oct. 1932, 6 June 1933 (Won).
Hwanghae Do —24 Apr. 1917 (SSC).
Kyonggi Do —Nov. 1909, 2 Apr.-22 May (4) 1909 (LiWM); 19, 20 Apr. 1917 (Kur); 6, 14 Mar. 1927 (Taka); 21 Apr. 1928, 25 Apr. 1930 (Won); Mar. 1928 (SoM); 13 Mar. 1931 (USNM); 2-27 Apr. 1946 (3) (MCZ).
Cholla Pukto —9 Apr. 1917 (2) (Kur).
Cholla Namdo —25 Feb. 1927 (Taka); 22 Oct.-22 Nov. 1928 (7), 21 Apr. 1932 (Uch).
Kyongsang Namdo—12 Mar. 1884 (USNM).

T. n. naumanni is a common winter resident from Kyonggi Do southward. Campbell (1892, 232) found the southward flight commenced in Hamgyong Pukto during the first week of October, 1889, and Y. Kuroda and Miyakoda (1919) give its season in Seoul as from October

through April. They were already common the first day I went afield and collected my first ones 22 November 1945, for I encountered three flocks that day of from five to ten birds each. I found them almost always in evidence throughout the winter and early spring, though never in great numbers, usually small bunches of from three to a dozen birds. There was a marked increase in their numbers 18 March as the first migrants from the south appeared, and larger flocks, numbering from ten to fifty birds were numerous during the ensuing fortnight. They thinned out rapidly again after 26 March, but a few kept straggling through well in to April, in company with *eunomus*. The latest spring record is Kuroda's of 20 April.

T. n. eunomus visits Korea strictly as a transient, far more plentiful in spring than in autumn. The LiWong November specimen is the only fall record, and Jouy's March bird from Kyongsang Namdo is the earliest spring arrival date. The autumn migration evidently goes southward across the Japan Sea to northern Japan, landing in central Honshu in the Ishikawa area, and the birds winter from southern Honshu south to the Ryukyus. The spring flight, never pronounced in Japan, goes northward farther westward along the coast of mainland Asia, following the main flight of *naumanni* after it leaves its wintering grounds in southern Korea. I collected a bird 17 March which is a good intergrade between the two races, and several I took during the *naumanni* flight in late March show intermediate characters which were entirely absent in the wintering birds. I saw the first well-defined *eunomus* 2 April, and collected two males. Their flight continued through the month, and was still in evidence when I left in early May, though it never assumed the proportions of the movement of the wintering race. They were always in smaller numbers, and it was unusual to see more than a few of them daily. The latest spring dates are the LiWong specimens of 22 May in Kyonggi Do and 26 May in Pyongan Pukto.

262. Monticola gularis (Swinhoe)

Oroecetes gularis Swinhoe, Proc. Zool. Soc. London, 1862, p. 318. (Tientsin, China.)

English: Swinhoe's Rock Thrush.
Japanese: Hime isohiyo (princess coast-bulbul.)

Specimen records:

Hamgyong Pukto—26 May 1912 (AMNH); 5 July 1929 (Won); 26 Aug. 1929 (2 juv.) (Yam).

Pyongan Pukto —Sept. 1915 (2) (SSC); 24, 26 May 1917 (4) (LiWM); 27 May 1917 (2) (Kur); 24, 26 May, 20 July 1917 (Taka); 11-19 May 1929 (11) (Yam).
Pyongan Namdo —24 May 1919 (Doi); 27 May 1931, 23 May 1932 (Won).
Cholla Namdo —20 May 1930 (Uch).

Here is another bird of the Asiatic mainland which is common in migration along the northern border of Korea, and seldom straggles farther south on the peninsula. In view of the two juvenals Orii collected in Hamgyong Pukto, and Taka-Tsukasa's July specimen from Pyongan Pukto, it is possible that the species breeds along the northern coasts of both provinces, and may be regarded as a rare summer resident. It is known to breed nearby in Manchuria. Won (1934, 93) calls it rare.

263. Monticola solitarius magnus (LaTouche)

Petrophila solitaria magna LaTouche, Bull. B. O. C., **40**, 1920, p. 97. (Japan.)

English: Large Red-bellied Rock-thrush.
Japanese: Iso hiyodori (coast bulbul.)

Specimen records:

Hamgyong Namdo—10 May 1903 (Roth).
Pyongan Pukto —3-9 June 1917 (4) (LiWM); 4, 9 June 1917 (Taka); 27 May, 1917, 1 June 1935 (SSC).
Pyongan Namdo —30 Apr. 1917 (Kur).
Kangwon Do —31 Mar., 17 Sept. 1914 (LiWM); 14-24 June 1929 (10) (Yam).
Kyonggi Do —7 Sept. 1883 (USNM); May 1887 (Tacz); 20 June 1909 (3), 30 Apr. 1911 (2) (LiWM); June 1917 (Kur); 4 June 1912 (SSC); 10 May 1922, May 1927 (SoM); 29 June 1933 (juv), 7 June 1934 (Uch).
Cholla Namdo —7 Jan., 20 Feb. 1914 (LiWM); 10 Oct. 1925, 31 Aug. 1930 (Uch).
Kyongsang Namdo—28 Apr. 1884 (USNM); 5 Jan. 1924 (Uch.).

The Red-bellied Rock-thrush is a not uncommon summer resident along both east and west coasts; a few winter along the southern shores. Taczanowski (1888, 463) says it is "common and nests, leaves the country in winter". Kuroda (1918, 539) says it "is sometimes met with on the rocky mountains". Cumming (1933, 38) writes "Along rocky coasts . . . This is the bird which is seen every summer around the rocks of the 'point' at Sorai Beach [Cholla Namdo]." According to

Hashimoto (1932) it is a year-round resident at Shichihatsu Island in Cholla Namdo. He also (1937) observed it occasionally in winter at Hachibi Island in Kyonggi Do. He saw three there 17 Dec. 1934, and again on 6 Feb. 1934 and 23 Feb. 1935. He found its nest 1 June 1933, and notes the young flew away 21 June that year. They left the nest 15 June 1934. Won (1934) considers it common and breeding; Yamashina (1941, 270) calls it a year-round resident in the southern part of Korea, with migrants going north to Manchuria.

264. Saxicola torquata stejnegeri (Parrot)

Pratincola rubicola stejnegeri Parrot, Verh. Orn. Ges. Bayern, 8, 1908, p. 124. (Etorofu and Hokkaido.)

English: Japanese Stonechat.
Japanese: No bitaki (field chat.)

Specimen records:

Hamgyong Pukto —19 May 1912 (AMNH); 18 Apr. 1918 (Taka); 8 Aug. 1929 (Won).
Hamgyong Namdo—25 July 1916 (SSC).
Pyongan Pukto —6-29 Apr. 1929 (7) (Yam).
Pyongan Namdo —29 Apr. 1931, 15 Apr. 1932 (Won).
Kangwon Do —11 Apr. 1914 (4) (LiWM); 19 June 1929 (Yam).
Kyonggi Do —10 Sept. 1883 (im.) (USNM); Aug. 1888 (Camp); 23 Apr. 1911 (LiWM); 22 Apr. 1917 (2) (Kur); 21 Mar., 9 May 1928 (Taka); 4 Apr. 1930 (Won); 8 Apr. 1933 (Uch); 13, 15, 26 Apr. 1946 (MCZ).
Cholla Namdo —24, 29 Apr. 1931 (Uch).
Kyongsang Namdo—20 Apr. 1884, 19, 24, 25 Apr. 1885, 11 Apr. 1886 (USNM).

The Stonechat is a not uncommon summer resident. Kalinowski missed it entirely, and Campbell (1892, 233) considered it an "uncommon visitor". Won (1934, 93) calls it common and breeding. Kuroda (1917, 57) found "a few" in April and early May along the west coast, which coincides with my own experience. I found scattered pairs at the heads of the valleys, on the peripheries of the upland farms, where the cultivated lands edge the brushy foothills. Y. Kuroda and Miyakoda (1919) call it a year-round resident, in which they are in error, and say they "saw a nest at Keifuku palace", which is possible, but hardly reliable. Despite the lack of confirmatory data, the species undoubtedly breeds in Korea, probably in the upland cultivated areas.

265. Tarsiger cyanurus cyanurus (Pallas)

Motacilla cyanurus Pallas, Reise versch. Prov. Russ. Reichs, **2**, 1773, p. 709. (Yenesei.)

English: Siberian Blue-tail.
Japanese: Ruri bitaki (azure chat.)

Specimen records:

Pyongan Pukto —2-9 Apr. 1929 (9) (Yam).
Pyongan Namdo—15 Apr. 1931 (Won).
Kyonggi Do —24 Oct. 1883 (USNM); Apr., Sept., Oct. 1889 (Camp); Nov. 1909, 23 Apr. 1911, 25 Oct. 1914 (2) (LiWM); 20-23 Apr. 1917 (5) (Kur); 7 May 1918, 14 Feb. 1930 (SSC); 12 Oct.-8 Nov. 1926 (10) (Taka); 1 June 1926, 13 Apr. 1928, 5 Apr. 1929, 30 Jan. 1930 (Won); 24 Oct. 1933 (2), 4 Nov. 1935 (Uch); 9-24 Apr. 1946 (12) (MCZ).
Cholla Namdo —19 Jan. 1930 (Yam); 12 Nov. 1931, 12, 23 Apr. 1931 (Uch).

The Siberian Blue-tail is a common spring and autumn transient in Korea; a few winter in the southernmost provinces. I found it a common migrant at Suwon through mid-April, where it is a bird of the woodlands, usually found in the willow thickets.

266. Phoenicurus auroreus auroreus (Pallas)

Motacilla aurorea Pallas, Reise versch Prov. Russ. Reichs, **3**, 1776, p. 695. (Selenka, Lake Baikal.)

English: Daurian Redstart.
Japanese: Jo bitaki (common chat.)

Specimen records:

Hamgyong Pukto —19 Apr.-2 June 1912 (5) (AMNH); 24 Aug., 25, 27, 28 Sept. 1917 (LiWM); 28, 29 July, 24 Oct. 1929 (Yam).
Hamgyong Namdo—1 May 1903 (3) (Roth).
Pyongan Pukto —23 Apr.-12 May 1929 (4) (Yam).
Pyongan Namdo —3 Apr., 6, 7, 31 Oct. 1932 (Won).
Kangwon Do —19, 20 June, 30 Nov. 1929 (Yam).
Kyonggi Do —12, 16 June, 2, 21 Aug., 8 Oct. 1883 (USNM); Nov., Jan., Feb., June 1886-8 (Tacz); Sept. 1888 (Camp); 28 Mar. (3), 12 Dec. 1911 (LiWM); 3 Oct. 1917 (SSC); 10 Oct.-3 Nov. 1927 (8) (Taka); 8 Mar. 1928, 9 Nov. 1929, 10 Mar. 1930 (Won); 7 June 1929, 4 Apr. 1930 (SoM); 5 Jan.-31 Mar. 1946 (23) (MCZ).
Cholla Namdo —1 Apr. 1927, 12 Nov. 1931 (Uch); 7 Jan. 1930 (Yam).
Kyongsang Namdo—18, 24 Dec. 1914 (LiWM).

The Redstart is a common summer resident in the central and northern highlands, and a common winter resident from Kyonggi Do southward. Every collector has taken it, and Won (1934, 93) quite rightly calls it the "most numerous of all chat species". Cumming (1933, 8) mentions its "oft-repeated and very sad little 'tchick, tchick', always accompanied by little nervous flirts of the tail, or of the more excited call he makes when startled. I had been watching the bird for years not knowing he had any other song when one bright sunny morning of spring . . . I was stopped by a very pleasing song as cheerful as the morning. I finally located its source, a male redstart in the very top of a tall poplar." Y. Kuroda (1935, 88) saw it in Chungchong Pukto 25 May 1931.

Yamashina (1941, 309) says it breeds from the central part of Korea northward, and that its definite known breeding district is in the mountains of Hamgyong Pukto and Kangwon Do. Won (*idem*) says it "builds its nest under the eaves of dwellings or other buildings." Yamashima (unpublished ms.) collected a nest with four fledglings, now in his museum, from under the eaves of a temple in Kangwon Do, 6 June 1936. Adachi (1941, 66) found it nesting in Hamgyong Pukto.

In the Suwon area I found it a not uncommon winter resident from December through March. Through the coldest weather a few could always be found in suitable cover. Several wintered in the shrubbery around the Station and College buildings. Their numbers began to increase in mid-March. There was a marked influx of migrants on 23 March, and Redstarts were abundant everywhere until 28 March, after which their numbers again dwindled off as the flight passed on. The last one was observed 10 April 1946.

267. Phoenicurus ochrurus rufiventris (Vieillot)

Oenanthe rufiventris Vieillot, Nouv. Dict. Hist. Nat., nouv. ed., **21**, 1818, p. 431. (South Africa, error = India.)

English: Eastern Indian Redstart.

Japanese: Kuro jo-bitaki (black common chat.)

This species is a straggler in Korea, known from a single record. Taka-Tsukasa (1919, 29) reported a single specimen, a male from the description, as being shown him by Viscount Matsudaira. It was collected in Hamgyong Pukto, 18 May 1918, and was purchased by Matsudaira from the Yokahama firm of Japanese collectors who succeeded to Owston's business after his death. When Matsudaira

was forced to dispose of his collection about 1925, this Redstart specimen was obtained for the Taka-Tsukasa collection and was destroyed with it in 1945.

268. Luscinia calliope (Pallas)

Motacilla calliope Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 697. (Yenesei.)

Turdus camtschatkensis Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 817. (Kamchatka.)

English: Ruby-throat.

Japanese: No goma (field steed.)

Yamashina (1929, 236) assigns the two Pyongan Pukto specimens, on the basis of their longer wings (over 78 mm.) to *L. c. camtschatkensis.* All the other Korean specimens have been identified as *calliope,* the southwestern race. The measurements of my Kyonggi Do adult male, wing 74 mm. tail 60.5 mm. tarsus 29 mm., place it well within the *calliope* range.

Specimen records:

Luscinia calliope camtschatkensis:
Pyongan Pukto—12, 17 May 1929 (Yam).

Luscinia calliope calliope:
Pyongan Namdo—10 May 1931, 30 Apr. 1932 (Won).
Kangwon Do —30 June 1914 (LiWM).
Kyonggi Do —1 Oct. 1919 (SSC); 10 Oct. 1920 (Kur); 6 Oct. 1927, 20 Apr. 1930 (Taka); 26 Apr. 1946 (MCZ).
Cholla Namdo —14 Apr. 1927, 12 Nov. 1931 (Uch).

The Ruby-throat is an uncommon transient in Korea.

269. Luscinia svecica weigoldi Kleinschmidt

Luscinia svecica weigoldi Kleinschmidt, Abh. Ber. Mus. Tier-u. Volkenk. Dresden, **16**, 1923 (2), p. 43. (northern Chihli.)

English: Weigold's Red-spotted Blue-throat.

Japanese: Ogawa komadori (Ogawa's steed-bird.)

The only record for this straggler in Korea is a pair Mori (1920, 319) collected in a marsh at Susang, Kyonggi Do, 18 October 1919. One of these is still in the Seoul Society of Natural History Collection; the other was destroyed in 1945 with the Kuroda collection.

270. Larvivora sibilans Swinhoe

Larvivora sibilans Swinhoe, Proc. Zool. Soc. London, 1863, p. 292. (Macao, China.)

English: Swinhoe's Red-tailed Robin.
Japanese: Shima goma (striped steed.)

Specimen records:

Hamgyong Pukto—26, 28 Sept. 1917 (LiWM).
Pyongan Pukto —7 June 1917 (LiWM); 7-17 May 1929 (10) (Yam).
Pyongan Namdo —30 May 1917 (LiWM); 12 May 1931 (Won).
Kyonggi Do —1 Oct. 1883, 7 May 1928 (USNM); 11 May 1887 (Tacz); 10 Sept. 1888 (Camp); 9, 14 May 1916 (LiWM); Apr. 1917 (Kur); 4 Oct. 1920 (SSC); 25, 27 Sept., 8 Oct. 1927 (Taka); 6 May 1928 (Won); 10 May 1929 (SoM); 16 May 1936 (Uch).
Cholla Namdo —13 May 1926 (Uch).

Though I did not encounter it, this species is evidently a not uncommon spring and autumn transient, especially from Kyonggi Do northward. Kuroda (1918, 540) says "it seems to be not uncommon in the neighborhood of Seoul. Its notes are musical." Y. Kuroda and Miyakoda (1919) list it for the Seoul region in late April, early May, and October, adding "comparatively common; they can be found singing by the inner fence of dwellings near Shochudan Park in Seoul. They are fond of a sheltered, sunny place."

271. Larvivora cyane (Pallas)

Motacilla cyane Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 697. (Dauria.)

English: Siberian Bluechat.
Japanese: Ko ruri (small lapis-jewel.)

Specimen records:

Hamgyong Pukto —23 Aug. 1917 (LiWM).
Pyongan Pukto —31 May 1917 (LiWM); 15 July 1917 (Taka); 24 May 1917 (SSC); 10-18 May 1929 (10) (Yam).
Kyonggi Do —July 1929 (SoM).
Cholla Namdo —12, 23 Nov. 1928, 27 Apr. 1930, 13 May 1931, 24, 25 Apr., 2 Nov. 1932 (Uch).
Kyongsang Namdo—7 May 1884, 1, 11 May 1886 (USNM).

The Siberian Bluechat is a not uncommon transient and an uncommon summer resident. Yamashima (unpublished ms.) has in his collection a nest with five eggs collected in the highlands of Kangwon Do 31 May 1936 by Matsuo Takahashi.

272. Phylloscopus trochiloides plumbeitarsus Swinhoe

Phylloscopus plumbeitarsus Swinhoe, Ibis, 1861, p. 330. (near Peking.)
English: Middendorff's Willow Warbler.
Japanese: Yanagi mushikui (willow insect-eater.)

Specimen records:

Hamgyong Pukto—14 Aug. 1917 (LiWM); 23 Aug. 1917 (Taka).
Pyongan Pukto —3, 4 May 1917 (4) (Kur); 24 May 1917 (LiWM); 17-27 May 1929 (5) (Yam).
Kyonggi Do —27, 28 Sept., 8 Oct. 1927 (Taka).

This species is apparently a not uncommon transient along the northern border. Yamashina (1941, 64) says "I saw many on Kumgansan Mountain [Kangwon Do] the last of May and early June, so I think this bird breeds there." However, there is no evidence of its breeding in Korea beyond the two August specimens from Hamgyong Pukto, and the 1942 Hand-List just lists it as occurring.

273. Phylloscopus tenellipes Swinhoe

Phylloscopus tenellipes Swinhoe, Ibis, 1860, p. 53. (Amoy, China.)
English: Pale-legged Willow Warbler.
Japanese: Yezo mushikui (Hokkaido insect-eater.)

Specimen records:

Hamgyong Pukto—18 May 1912 (AMNH).
Pyongan Pukto —14 May-3 June 1929 (8) (Yam).
Kangwon Do —7 Sept. 1914 (LiWM).
Cholla Namdo —2, 20 Sept. 1924, 12 Sept. 1926 (Uch).

This species is of uncertain status in Korea, certainly an uncommon (or little observed) transient, and perhaps a rare summer resident in the northern highlands. Though Won (1934, 90) says it is common and breeds at Nonsadong, Hamgyong Pukto. Yamashina says nothing whatever of its possible nesting in Korea. The 1942 Hand-List perhaps takes its breeding authority from Hartert (1910, 512) who states it is "presumed" to breed in both Japan and Korea.

274. Phylloscopus borealis Blasius

Phylloscopus borealis Blasius, Naumannia, 1858, p. 313. (Sea of Okhotsk.)
Phylloscopus xanthodryas Swinhoe, Proc. Zool. Soc. London, 1863, p. 296. (Amoy, China.)
Phylloscopus borealis examinandus Stresemann, Nov. Zool., 1913, p. 353. (Bali.)

English: Arctic Willow Warbler.
Japanese: Mushikui (insect-eater.)

The 1942 Hand-List recognizes all three of the above races as occurring in Korea, but gives none of them as breeding. Its single record for the Kamchatka breeding form, *P. b. examinandus*, from Shichihatsuto [Cholla Namdo] may be in error, for I have been unable to trace it to its original source. There is no such specimen, nor any record of there ever having been one in the Uchida collection, where all the Shichihatsuto material was sent. The other two races are each well represented in the Japanese collections. While the northern race, *P. b. borealis* is the more numerous, its occurrence averages earlier in spring and later in autumn than *xanthodryas*, the southern form, which Yamashina (1932, 233) believes possibly breeds in Korea.

Specimen records:

Phylloscopus borealis xanthodryas:
Hamgyong Pukto—10 Sept. 1917 (LiWM).
Pyongan Pukto —28 May-4 June 1929 (3) (Yam).
Pyongan Namdo —9 May 1931, 23 May 1933 (Won).
Kyonggi Do —8 Sept., 6 Oct. 1927 (Taka); 19 Apr. 1928, 24, 29 Sept., 8, 22, 23 Oct. 1929 (Won); 2 Oct. 1929 (SoM).
Cholla Namdo —19 May 1932 (Uch).

Phylloscopus borealis borealis:
Hamgyong Pukto—1, 16, 19 Sept. 1917 (LiWM).
Pyongan Pukto —26 May, 8 June (6) 1917 (LiWM); 29 May 1917 (Taka); 17 May-3 June 1929 (17) (Yam).
Pyongan Namdo —Aug. (Kur); 21, 22 May 1932 (Won).
Kangwon Do —23-30 Sept. 1914 (7) (LiWM).
Kyonggi Do —May 1887 (Tacz); 23 May 1914, 15 Oct. 1920 (SSC); 25 Oct. 1914 (LiWM); 27 Sept. 5 Oct. 1927, 10 Apr. 1930 (2) (Taka); 19 Apr. 1928 (USNM); 10 Aug. 1927 (Won); 2 Oct. 1929 (SoM).
Cholla Namdo —12 Sept. 1926 (2), 2 Dec. 1927, Sept. 1928, May, June 1930, 7 Oct. 1931, 19 May 1932 (2) (Uch).

The Arctic Willow Warbler is a common spring and autumn transient throughout Korea, and perhaps a not uncommon summer resident in the highlands. Taczanowski (1888, 463) says "common in spring and autumn, rare in summer". Won (1934, 90) calls it common and breeding. Cumming (1933, 35) writes it is "fairly common in all the woods on both migrations in Korea, and a summer resident in the forests of the mountains. Its weak little song may be heard all through the summer months as it feeds through the forest."

275. Phylloscopus coronatus coronatus (Temminck and Schlegel)

Ficedula coronata Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 48, pl. 18. (Japan.)

English: Crowned Willow Warbler.

Japanese: Sendai mushikui (Sendai insect-eater.)

Specimen records:

Hamgyong Pukto —2 Sept. 1917 (LiWM).
Pyongan Pukto —16-28 Apr. 1929 (9) (Yam).
Pyongan Namdo —26 June 1932 (Won).
Hwanghae Do —1 May 1918 (Taka).
Kangwon Do —undated (SSC).
Kyonggi Do —6, 10, 19 Aug., 2, 14 Oct. 1883 (USNM); Apr. 1887 (2) (Tacz); 21 Apr. 1889 (Camp); 17, 23 Apr. 1911, 30 May 1914, 19 July 1917 (LiWM); 3 Oct. 1926 (Taka); 22 Apr. 1929 (SoM); 9 Aug. 1929 (Won); 12 Apr.-1 May 1946 (10) (MCZ).
Cholla Namdo —21, 30 Aug. 1930, 23, 30 Apr. 1932 (Uch).
Kyongsang Namdo—4, 7 May 1885, 3 May 1886 (USNM).

This species is probably a not uncommon summer resident. Won (1934, 90) calls it common, while Yamashina (1941, 80) and the 1942 Hand-List both consider it as breeding in Korea. I shot willow warblers on sight, and saw practically none that I did not collect. This is the only species I encountered. It occupies the same ecological niche as that of the North American wood-warblers, and the first arrivals at Suwon came just as the warbler flight would be expected in New England, when the first green is starting to appear on the forest trees. Perhaps of significance, indicating a separate migratory movement of the sexes, is the fact that my first four specimens taken from 12 to 19 April are all males, while my last six, collected from 21 April to 1 May, are all females.

276. Phylloscopus proregulus proregulus (Pallas)

Motacilla proregulus Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 499. (Ingode River, southeastern Transbaicalia.)

English: Pallas' Willow Warbler.

Japanese: Karafuto mushikui (Sakhalin insect-eater.)

Specimen records:

Hamgyong Pukto—24 May 1912 (AMNH); 18, 25 Apr. 1918 (Taka).
Pyongan Pukto —2 May 1917 (Kur); 7 Oct. 1917 (Taka); 5-17 Apr. 1929 (12) (Yam).
Pyongan Namdo —21 May, 27 Oct. 1932 (Won).
Kangwon Do —14 Sept. 1914 (LiWM).

This species is a mainland migrant which passes through northern Korea fairly regularly, but rarely occurs elsewhere on the peninsula. Won (1934, 90) calls it rare, but from the specimen record it seems not uncommon.

277. Phylloscopus inornatus inornatus (Blyth)

Regulus inornatus Blyth, Journ. As. Soc. Bengal, **11**, 1842, p. 191. (near Calcutta.)

English: Yellow-browed Willow Warbler.

Japanese: Kimayu mushikui (yellow-eyebrowed insect-eater.)

Specimen records:

Hamgyong Pukto—17, 20, 25 Sept. 1917 (LiWM).
Pyongan Pukto —7 Oct. 1917 (Taka); 16 Apr.-18 May 1929 (14) (Yam).
Hwanghae Do —1 May 1918 (Taka).
Kangwon Do —30 Sept., 6, 9 Oct. 1914 (LiWM).
Kyonggi Do —4, 6 Oct. 1883 (USNM); Oct. 1889 (Camp); 23 Apr. 1911, 25 Oct. 1914 (LiWM); 18 Apr. 1917 (Kur); 4 June 1934 (Uch).

This species is a not uncommon transient, both spring and autumn, from Kyonggi Do and Kangwon Do northward. Campbell (1892, 234) found it common near Seoul in October. Won (1934, 233) calls it common. Yamashina (1941, 90) says "the southern limit of breeding is Hamgyong Namdo. Not many breed in Korea, but many pass through in spring and autumn." The 1942 Hand-List does not seem to regard the breeding evidence as conclusive.

278. Phylloscopus fuscatus fuscatus (Blyth)

Phyllopneuste fuscata Blyth, Journ. As. Soc. Bengal, **11**, 1842, p. 113. (Calcutta.)

English: Brown Willow Warbler.

Japanese: Muji sekka (muji is plain colored, sekka is autochthonous.)

Specimen records:

Hamgyong Pukto—1 October 1929 (Yam).
Pyongan Pukto —26 Apr. 1929 (Yam).
Cholla Namdo —19 May 1932 (Uch).

This species is evidently a rare transient in Korea, perhaps of more regular occurrence along the northern border than the record indicates.

279. Phylloscopus schwarzi (Radde)

Sylvia (*Phyllopneuste*) *schwarzi* Radde, Reisen Süd. Ost. Sib., **2**, 1863, p. 260, pl. 9. (Tarei-Nor and Buteya Mts.)

English: Radde's Willow Warbler.

Japanese: Karafuto mujisekka (Sakhalin plain-colored bush-warbler.)

Specimen records:

Hamgyong Pukto—27 July 1929 (Yam).
Pyongan Pukto —11-20 May (4) (Yam).
Kyonggi Do —11 May 1887 (Tacz).

This species is a rare transient along the northern border, and a rare summer resident in the northern mountains. Its occurrence in Korea was based on Kalinowski's single Kyonggi Do specimen until Orii collected it in the north. Taczanowski comments (1888, 455) "One finds it in summer, but in small numbers". Yamashina (1941) states that "a few breed in the mountains." Orii collected a nest with three eggs in Hamgyong Pukto 25 July 1929, now in the Yamashina Museum.

280. Horeites cantans borealis (Campbell)

Cettia minuta borealis Campbell, Ibis, 1892, p. 235. (Inchon, Kyonggi Do, Korea.)

English: Manchurian Bush Warbler.

Japanese: Chosen uguisu (Korean nightingale.)

Specimen records:

Hamgyong Pukto—2, 28 Sept. 1917 (3) (LiWM); 18, 25 Apr. 1918 (Taka); 28 Aug. (juv.), 19 Oct. 1929 (Yam).
Pyongan Pukto —5, 8, 9 June 1917 (4) (LiWM); 8 June 1917 (SSC).
Pyongan Namdo —31 May 1932, 19 Oct. 1933, 13 Oct. 1935 (Won).
Kangwon Do —15, 22 Sept. 9 Oct. 1914 (LiWM); 13 June-16 July 1929 (9) (Yam).
Kyonggi Do —14 Oct. 1883, 19 Apr. 1928 (USNM); 10 Sept. 1889 (Camp); 27 Apr. 1911, 20 Oct. 1913, 27 June 1915 (LiWM); 23 Apr. 1917 (Kur); 11 May 1926, 16 Oct. 1927, 19 Apr. 1929 (Won); Oct. 1927 (SoM); 6, 12 Oct. 1927, 13, 16 Apr. 1946 (MCZ).

This species is a common summer resident from Kyonggi Do and Kangwon Do northward. Kuroda (1918, 543) says "On the plains in Korea this form is not very common." Y. Kuroda (1918, 20) found it singing "commonly" in Kangwon Do and Kyonggi Do in July and August, and gives its migration seasons at Seoul (1919) as late April and early May, and October, adding "uncommon". Won (1934, 91) calls it common and breeding. Cumming (1933, 36) writes "This bird's name in Japanese has been translated as Nightingale . . . probably because of its fine song, a pleasing variety of calls and whistles. This is the more noteworthy in the general paucity of first class song birds in Korea. The bird is shy and may be heard many times before one is fortunate enough to get near enough to see it, but it seems to be fairly well distributed over the country as a summer resident in the hills and mountains."

I collected the only two I saw, 13 and 16 April, singing in the shrubbery near the Agricultural Station buildings at Suwon.

All authorities agree it breeds in Korea, but the juvenal collected by Orii in Hamgyong Pukto is the only proof other than the collecting dates. Yamashina (1932, 234) doubts the identity of a nest and eggs Orii collected, because of the color of the eggs and the structure of the nest.

281. Urosphena squameiceps ussuriana (Seebohm)

Cettia ussurianus Seebohm, Cat. Bds. Brit. Mus., **5**, 1881, p. 143. (Ussuri.)

English: Short-tailed Bush-Warbler.

Japanese: Yabusame (autochthonous, but may mean bamboo shark.)

Specimen records:

Hamgyong Pukto —18, 25 Apr. 1918 (Taka).
Pyongan Pukto —24 Apr.-8 May (9) (Yam).
Pyongan Namdo —6 May 1936 (Won).
Kangwon Do —15 Sept. 1914 (LiWM); 9 July 1929 (Yam).
Kyonggi Do —5 May 1917 (LiWM); 10 Sept. 1917 (SSC); 3 Apr. 1925 (Mom); 27 Sept. 1927 (Taka); 20, 22 Apr. 1932, 9 May 1934 (Uch).
Cholla Namdo —15 Oct. 1926 (Uch).
Kyongsang Namdo—25 Apr., 2, 3 May 1886 (USNM).

The Short-tailed Bush Warbler is a not uncommon summer resident. Kuroda (1917, 60) gives a sight record for Kyonggi Do 23 April 1917. Yamashina and the 1942 Hand-List both say that it breeds in Korea, but there is no evidence other than the collecting dates.

282. Locustella fasciolata (Gray)

Acrocephalus fasciolatus Gray, Proc. Zool. Soc. London, 1860, p. 349. (Batchian.)

English: Gray's Grasshopper Warbler.
Japanese: Yezo senniu (autochthonous, but Yezo is Hokkaido; sennin is a hermit, a fairy or a gnome; niu means to enter.)

Specimen records:

Pyongan Pukto—8 June 1917 (SSC); 6, 8 June 1917 (4) (LiWM); 8, 9 June 1917 (Taka); 4 June 1929 (Yam).
Kyonggi Do —June 1917 (Kur); May 1926 (SoM).
Cholla Namdo —13 Sept. 1926 (2), 21 Aug. 1930 (2), 16 Aug. 1931 (2), 2, 10 Sept. 1932 (Uch).

This species is probably an uncommon summer resident in western Korea. The 1942 Hand-List considers that it breeds there, but there is no information available about its Korean status other than the specimens listed above.

283. Locustella ochotensis pleskei Taczanowski

Locustella pleskei Taczanowski, Proc. Zool. Soc. London, 1889, p. 620. (Korea.)

English: Taczanowski's Grasshopper Warbler.
Japanese: Uchiama shima senniu (Uchiama's streaked grasshopper warbler.)

Specimen records:

Pyongan Pukto—24 May 1917 (SSC).
Kyonggi Do —15 July 1887 (3) (Tacz); 15 Nov. 1913 (LiWM); 25 July 1933, 1 July 1934 (Uch).
Cholla Namdo —12 Sept., 5 Oct. 1926, 2 Sept.-12 Nov. 1931 (8), 7, 23 May 1933 (Uch).

This species is a not uncommon but localized summer resident, confined to islands along the west coast. Of the specimens he described in 1889, Taczanowski (1888, 455) wrote originally (he assigned them first to *L. fasciolata*) "Three males killed 15 July at Inchon on the little islets about a kilometer off the coast, covered with shrubs and tall grasses, where it nests; at ebb tide these islets are joined to the mainland. The bird leaves the country in winter. Our traveller also heard it singing along the banks of the Seoul River, but was not able to collect it there."

Ishizawa (1933, 68) gives an account of its breeding on the islands in southwestern Korea. Besides three breeding adults from Shichihatsu Island in Cholla Namdo, he collected an adult and three nests in 1933 on Hachibi Island in Kyonggi Do, one with four eggs 16 June, another with four eggs 15 July, and one with two chicks and two eggs 17 July. He writes "On Shichihatsu Island its nests are in willow thickets, 30 cm. off the ground, on Hachibi in shrubbery 15 cm. to 2 meters high. The exterior of the nest is dead willow leaves with grasses and a few feathers, the interior is dead grass, rootlets and feathers . . . It must breed on every small island near by, but lack of transportation prevented verification . . . "

Hashimoto (1934) found it "ready to nest" on Hachibi Island 25 May 1933, and later that season found thirteen nests. In 1934 he found two clutches of five eggs and one of three, but says the average is four. He found the incubation period to be fourteen days, and that the young leave the nest from thirteen to fifteen days after hatching. They leave the island early in September, and his latest date is 14 September 1933.

284. Locustella certhiola minor David and Oustalet

Locustella minor David and Oustalet, Ois. de Chine, 1877, p. 250. (Peking.)
English: David's Grasshopper Warbler.
Japanese: Shiberiya senniu (Siberian grasshopper warbler.)

Specimen records:

Hamgyong Pukto—Aug. 1912 (SSC); 17 Aug. 1917 (LiWM).
Pyongan Pukto —Sept. 1915 (SSC); 31 May, 6, 7, 8 June 1917 (5) (LiWM); 24-30 May 1929 (6) (Yam).
Kyonggi Do —17 May, 15 June (J. B. Hurley).

This species is apparently an uncommon late spring and early autumn transient along the northern border, probably breeding nearby in northern Manchuria or southeastern Siberia. Yamashina (1941, 151) hypothesizes that it might breed in Hamgyong Pukto, which the 1942 Hand-List disallows, evidently as unproved. Two specimens in fresh plumage, collected by A. S. Loukashkin at Inchon, Kyonggi Do, are in the collection of Mr. J. B. Hurley of Yakima, Washington. The year of collection is not stated on the labels.

285. Locustella lanceolata (Temminck)

Sylvia lanceolata Temminck, Man. d'Orn., ed. 2, 4, 1840, p. 614. (Russia.)
English: Streaked Grasshopper Warbler.
Japanese: Makino senniu (makino means a pasture, but is also a man's common name. Senniu is autochthonous.)

Specimen records:

Pyongan Pukto —24 May 1917 (SSC); 26 May, 3, 6, 8, 9 June 1917 (7) (LiWM); 31 May, 26 Sept. 1917 (Taka); 11-23 May 1929 (10) (Yam).
Pyongan Namdo—22 May 1932 (Won).
Kangwon Do —29 Sept., 8 Oct. 1914 (LiWM).
Cholla Namdo —27 Oct. 1924, 11 Sept. 1931 (Uch).

This species is a spring and autumn transient along the northern border, plentiful at times, and perhaps an uncommon summer resident there. Won (1934, 91) calls it rare. Yamashina (1941, 155) says "many pass through Korea in spring and autumn, and a few breed" in which the 1942 Hand-List concurs, though there is no breeding evidence whatever.

286. Phragmaticola aedon rufescens Stegmann

Phragamaticola aedon rufescens Stegmann, Journ. f. Orn., 1929, p. 250. (Amur.)
English: Amur Pallas' Reed Warbler.
Japanese: Hashibuto oyoshikiri (big-billed marsh-reed cutter.)

Specimen records:

Pyongan Pukto—26 May 1917 (LiWM); 20-27 May 1929 (7) (Yam).
Cholla Namdo —5 May 1931, 25 Apr. 1932 (Uch).

Here is another continental migrant, the edge of whose flight route touches northern Korea. It is undoubtedly of fairly regular occurrence during the spring flight, especially along the northern border.

287. Acrocephalus arundinaceus orientalis (Temminck and Schlegel)

Salicaria turdina orientalis Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 50, pl. 20B. (Japan.)

English: Eastern Great Reed Warbler.
Japanese: O-yoshikiri (large marsh-reed cutter.)

Specimen records:

Hamgyong Pukto —12 June 1912 (AMNH).
Hamgyong Namdo—24, 27 July 1886 (5) (USNM); 10, 11 May 1903 (Roth).
Pyongan Pukto —4, 12 June 1917 (Taka); 8, 9 June 1917 (LiWM); undated (Kur); 20 May-3 June 1929 (12) (Yam).
Pyongan Namdo —27 July 1917 (SSC); 3, 24, 25 June 1931 (Won).
Hwanghae Do —27, 28 June 1913 (LiWM).
Kangwon Do —8 Sept. 1914 (2) (LiWM).
Kyonggi Do —May 1925 (SoM); 25 Sept., 4 Oct. 1927 (Taka).
Cholla Namdo —12 Sept. 1926, 7 Oct. 1931, 7 May 1932 (Uch).

The Great Reed Warbler is a common summer resident in the northern half of Korea. Won (1934, 91) says it is common and breeds. Y. Kuroda (1918, 22) found "very many of them" in full song in Kangwon Do 25 July. He and Miyakoda (1919) say "this bird can be found in marsh thickets at Yongsan [near Seoul] but scarcer than in Kangwon Do". They record it only for July and October in their chart but add "seems to stay all summer, but have not yet found its nest". There is a nest and eggs in the LiWong Museum without data. Cumming (1933, 36) writes "It is a regular summer resident of the marshes in Korea where it comes to breed late enough for the reeds in the spring to have grown large enough for cover. Here it spends the summer season where it may be heard at all hours of the day, its harsh grating song being one that cannot easily be mistaken after having been once identified."

288. Acrocephalus bistrigiceps Swinhoe

Acrocephalus bistrigiceps Swinhoe, Ibis, 1860, p. 51. (Amoy.)
English: Von Schrenk's Reed Warbler.
Japanese: Ko yoshikiri (small marsh-reed cutter.)

Specimen records:

Hamgyong Pukto—1-13 Oct. 1929 (3) (Yam).
Pyongan Pukto —3, 8 June 1917 (LiWM); 21 May 1917 (SSC); 25 May-1 June 1929 (5) (Yam).
Kyonggi Do —8 Oct. 1916 (LiWM).
Cholla Namdo —15 Oct. 1926, 20 May, 1, 28 Oct., 12 Nov. 1930, 7 Oct. 1931 (Uch).

This species appears to be a not uncommon spring and autumn transient, though it is considered by both Yamashina (1941, 172) and the 1942 Hand-List to breed in Korea.

289. Regulus regulus japonensis Blakiston

Regulus japonensis Blakiston, Ibis, 1862, p. 320. (Hakodate, Hokkaido.)
English: Golden-crowned Kinglet.
Japanese: Kiku itadaki (the chrysanthemum-crowned one.)

Specimen records:

Hamgyong Pukto —16-21 Oct. 1929 (11) (Yam).
Pyongan Namdo —26 Oct. 1932, 24 Sept. 1933 (Won).
Kyonggi Do —27, 30 Oct. 1887 (Tacz); Apr., Sept., Oct. 1889 (4) (Camp); 12 Nov. 1909 (4), Feb. 1910, 27 Mar. (2), 5, 20 Dec. 1911 (LiWM); 22 Apr. 1917 (Kur); 28 Apr. 1919 (SSC); May 1926 (SoM); 1-7 Nov. 1926 (5), 13 Feb. 1928 (Taka); 23, 29 Oct. 1929 (Won).
Chungchong Namdo—9 Apr. 1917 (Kur).
Cholla Namdo —9 Jan. 1930 (Yam); 4, 14 Apr., 8 May (8) 1927 (Uch).

The Golden-crowned Kinglet is a fairly common but irregular transient throughout Korea, and winters in the central and southern portions. Taczanowski (1888, 455) found it "very common in autumn and throughout the winter in the pine forests". Y. Kuroda and Miyakoda (1919) list it only for April on their Seoul chart, adding "four or five birds were found in the pines of Seoul Middle School which were not

entered in the list because it was a very rare occurrence". Cumming (1933, 29) writes "Seen in Korea in the winter where it spends that season with the chickadees. Most often seen in the pine forests." Hashimoto (1930) saw one at Shichihatsu Island, Cholla Namdo, 28 October 1930, and (1937) records Kinglets from Hachibi Island, Kyonggi Do, 4, 20 October 1932, 29 September 1934, and 21 April and 17 September 1936. Won (1934, 88) says it is common and that it breeds in Korea, in which observation he is not joined by the 1942 Hand-List, though there is a questionable set of eggs and nest in the LiWong Museum labelled "Kiku itadaki, Kyonggi Do, 20 May 1910." Though I was constantly on the alert for it, I did not encounter it during my stay in the country.

MUSCICAPIDAE

290. Terpsiphone atrocaudata atrocaudata (Eyton)

Muscipeta atrocaudata Eyton, Proc. Zool. Soc. London, 1839, p. 102. (Japan.)

English: Japanese Paradise Flycatcher.

Japanese: San ko cho (three-rayed bird.)

Specimen records:

Kyonggi Do —10 June 1914 (SSC); 10, 11, 12 June 1914 (LiWM).
Cholla Pukto —18 Nov. 1916 (2) (Kur).
Cholla Namdo —1 May 1927, 28 Sept. 1928 (Uch).
Kyongsang Namdo—3 May (3), 11 May (2) 1884 (USNM).

The Japanese Paradise Flycatcher is a rare transient of irregular occurrence in southern Korea. Jouy (1910, 653) wrote "I have only met with this bird in Korea, in the southeastern part of the country, none being observed near Seoul, where other species of flycatchers were abundant. In Fusan they make their appearance about the first of May, the males a few days in advance of the females, and remain about a fortnight." Hashimoto (1931, 1932) saw it occasionally at Shichihatsu Island in Cholla Namdo, on 15 July and 25 September 1931, and 2 May 1932. He also (1937) observed it at Hachibi Island in Kyonggi Do, where he saw a male 8 May 1934, and pairs on 29 August 1934 and 16 May 1936. Of dubious identity are two sets of nests and eggs in the LiWong collection, labelled "Sankocho, Kangwon Do, 10 July 1935."

291. Terpsiphone paradisi incei (Gould)

Muscipeta incei Gould, Bds. Asia, **2**, 1852, pl. 19. (Shanghai.)

English: Chinese Paradise Flycatcher.

Japanese: Kawari sankocho (varied three-rayed bird.)

Specimen records:

Pyongan Pukto—31 May 1917 (2) (SSC); 4 June 1917 (LiWM); 25 May-4 June 1929 (6) (Yam).
Kyonggi Do —July 1917 (Kur).

The Chinese Paradise Flycatcher is apparently a not uncommon spring transient in northwestern Korea, and practically unknown elsewhere in the country. Bergman (1938, 156) gives sight records for the species' arrival in late May at Riuganpo, Pyongan Pukto. From the specimen records Yamashina (1941, 12) concludes "many in spring in Pyongan Pukto, but breeding there unknown", though he found it nesting commonly in eastern and southern Manchuria (1939, 490). Yet in 1942 the Hand-List states it breeds in Pyongan Pukto.

292. Alseonax latirostris latirostris (Raffles)

Muscicapula latirostris Raffles, Trans. Linn. Soc. London, **13**, pt. 2, 1822, p. 312. (Sumatra.)

English: Sumatran Brown Flycatcher.

Japanese: Ko same bitaki (little shark flycatcher.)

Specimen records:

Hamgyong Pukto —10, 19 Sept. 1917 (5) (LiWM); 21 Sept. 1917 (Taka).
Hamgyong Namdo—31 May-25 June (6) (AMNH).
Pyongan Pukto —24, 26 May 1917 (4) (LiWM); 4-12 May 1929 (10) (Yam).
Pyongan Namdo —21 May 1917 (Taka); 10 May 1931, 7 Sept. 1932 (Won).
Kyonggi Do —2, 4 Oct. 1883 (USNM); May 1887 (Tacz); 16 Oct. 1888 (Camp); 7 May 1909, 20, 27 Apr. 1911 (3) (LiWM); 2 June 1918, 11 Oct. 1929 (SSC); 15 May 1925, 15 May 1929, 11 Oct. 1928 (SoM); 5 Dec. 1927 (Taka); 20, 25 May 1927, 11 Oct. 1928, 15 Oct. 1929 (Won).
Cholla Namdo —29 Apr., 10 May, 11 Sept., 7 Oct. 1931 (Uch).
Kyongsang Namdo—1 June 1884 (USNM).

This species is a common spring and autumn transient. Won (1934, 89) says it is common and breeds at Nonsadong, Hamgyong Pukto.

Yamashina (1941, 19) also surmises that it breeds in Korea, a conclusion not followed by the 1942 Hand-List.

293. Hemichelidon griseisticta Swinhoe

Hemichelidon griseisticta Swinhoe, Ibis, 1861, p. 330. (Amoy and Taku.)
English: Chinese Grey-spotted Flycatcher.
Japanese: Yezo bitaki (Hokkaido flycatcher.)

Specimen records:

Pyongan Pukto —20-23 May 1929 (4) (Yam).
Pyongan Namdo —15 May 1931 (Won).
Kangwon Do —9, 16 Sept. 1914 (LiWM).
Kyonggi Do —23 May 1913 (SSC); 15 May, 29 Oct. 1929 (SoM); 29 May 1930 (Won).
Kyongsang Namdo—23-28 Sept. 1885 (4) (USNM).

This species is a not uncommon spring and autumn transient. Won (1934, 89) considers it a common migrant. Cumming (1933, 34) says "Observed in South Korea on migration usually from two to four or five together. Though more active in the trees than the American flycatchers which form a different family, these eastern birds have the same habit of sitting quietly on a limb and from it darting out at some winged insect which is caught in flight. They are easy to approach seemingly much more interested in watching for their prey than in bothering about the intruder."

294. Hemichelidon sibirica sibirica (Gmelin)

Muscicapa sibirica Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 936. (eastern Siberia.)
English: Siberian Flycatcher.
Japanese: Same bitaki (shark flycatcher.)

Specimen records:

Hamgyong Pukto—16 Sept. 1917 (LiWM).
Pyongan Pukto —26 May-9 June 1917 (5) (LiWM); 24-28 May 1929 (8) (Yam).
Kangwon Do —10 Sept. 1914 (LiWM).
Kyonggi Do —28 May, 2 Oct. 1883 (USNM); May 1888 (Camp); May (Kur).
Cholla Namdo —13, 29 May 1928, 24 Mar.-10 June 1930 (4) (Uch).

The Siberian Flycatcher is a not uncommon spring and autumn transient, possibly more common in the northern boundary provinces than it is farther south. There are no data in literature other than the above, yet the 1942 Hand-List says the species breeds in Korea, which is improbable.

295. Siphia parva albicilla (Pallas)

Muscicapa albicilla Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 462. (Daurian region.)

English: Eastern Red-throated Flycatcher.
Japanese: Ojiro bitaki (white-tailed flycatcher.)

Specimen records:

Hamgyong Pukto — 20 Sept. 1917 (LiWM).
Pyongan Pukto — 26 May 1917 (LiWM); 8, 19 May 1929 (Yam).
Kangwon Do — 30 Sept. 1914 (LiWM).
Kyonggi Do — 4, 6, 8 Oct. 1883 (USNM); 8 Nov. 1926 (Taka); 9 May 1934 (Uch).

This species is evidently an uncommon spring and autumn transient in the northern half of Korea.

296. Siphia mugimaki (Temminck)

Muscicapa mugimaki Temminck, Pl. Col., livr. 97, 1835, pl. 577, fig. 2. (Japan.)

English: Japanese Robin Flycatcher.
Japanese: Mugimaki (autochthonous, but means to sow wheat or barley.)

Specimen records:

Hamgyong Pukto — 25, 27 Sept. 1917 (LiWM).
Pyongan Pukto — 24 May 1917 (LiWM); 7-24 May 1929 (11) (Yam).
Pyongan Namdo — 15 May 1930, 6 May 1932 (Won).
Kangwon Do — 11 Sept., 1 Oct. 1914 (LiWM).
Kyonggi Do — 1-20 Oct. 1883 (31), 30 Oct. 1926 (USNM); May 1887 (Tacz); 13 May 1909, 25 Oct. 1914 (LiWM); Apr. 1917 (SSC); 7 Oct., 27 Nov. 1929 (Won); 10 Oct. 1928, 28 Sept. 1929 (SoM); 9 May 1934 (Uch).
Cholla Namdo — 22 May 1928, 7, 11 May, 12 Nov. 1931 (Uch).
Kyongsang Namdo — 19 Oct. 1884, 2 May, 1 June 1886 (USNM).

The Mugimaki Flycatcher is a common spring and autumn transient, most abundant in May and October.

297. Muscicapula narcissina Temminck

Muscicapa narcissina Temminck, Pl. Col., livr. 97, 1835, pl. 517, fig. 1 (Japan)
Muscicapa Zanthopygia Hay, Madras Journ., **13** (2), 1845, p. 162. (Malacca.)

English: Narcissus Flycatcher.
Japanese: Ki bitaki (yellow flycatcher.)

The Sakhalin and Japan subspecies, *M. n. narcissina* occurs as an irregular transient visitor in southern Korea. It is a well-defined race, larger than the Korean form, *zanthopygia*, and with a yellow instead of a white supra-orbital stripe. I have examined the four specimens in the Uchida collection, and find them correctly identified. Dr. Herbert Friedmann re-examined the Jouy skins at my request and assures me (*in litt.*) "they are indeed of the nominate race."

Specimen records:

Muscicapula narcissina narcissina:
Cholla Namdo — 29 May 1928, 21 Aug. 1930 (2), 9 Apr. 1931 (Uch).
Kyongsang Namdo — 27 Apr., 10, 11 May 1884, 2 May 1886 (USNM).

Muscicapula narcissina zanthopygia:
Hamgyong Pukto — 23, 24 Aug. 1917 (LiWM).
Pyongan Pukto — 26 May 1917 (3) (LiWM); 6 July 1917 (Taka); 28 Apr.-12 May 1929 (12) (Yam).
Pyongan Namdo — 8 Sept., 7 May 1932, 27 May 1935 (Won).
Kyonggi Do — 10 June-2 Aug. (12), 8 Aug. (juv) 1883 (USNM); Apr., May 1887 (Tacz); May (4) (Camp); 13 May 1909 (6), 17-23 June 1911 (4), 8-27 June 1915 (5) (LiWM); 22, 23 Apr. 1917 (5) (Kur); 15 May 1927, 28 Apr. 1929 (SoM); 28 Apr., 7 May 1928, 3 Apr., 3 May 1929, 3 June 1930 (Won); 9 May 1934, 18 May 1936 (Uch); 17-24 Apr. 1946 (18) (MCZ).
Cholla Namdo — 30 Apr. 1932, 20 May 1930 (Uch).
Kyongsang Namdo — 7 May 1884 (USNM).

The Narcissus Flycatcher is a common summer resident, abundant in the deciduous woodlands during its spring migration. It arrives in Kyonggi Do in mid-April, becoming for the ensuing ten days the dominant bird of the sprouting woodlands. By early May the migrants have passed through, and the residents of the area are selecting their breeding territories. Y. Kuroda and Miyakoda (1919) give its season near Seoul as from April through September, which, judging by the specimen record, is about correct, though there are insufficient autumn records to give an accurate departure date.

There are two sets of nests and eggs in the LiWong Museum, dated 23 May 1910 and 8 June 1913 respectively, both from Kyonggi Do. Y. Kuroda and Miyakoda (*idem*) "found a nest in the peach orchard of the Seoul Middle School". Cumming (1933, 34) says "The nest is built in holes in trees, usually near the water. It is a very fragile structure of fine leaves, roots, grass and hair. There are five light pink eggs, speckled brownish red and purple, heaviest toward the larger end."

298. Muscicapula cyanomelana cyanomelana (Temminck)

Muscicapa cyanomelana Temminck, Pl. Col., livr. 79, 1829, pl. 470. (Japan.)

English: Japanese Blue Flycatcher.
Japanese: O-ruri (large lapis jewel.)

The Japanese find their series of Korean breeding birds indistinguishable from those of Honshu. They claim the Siberian race, *M. c. cumatilis* Thayer and Bangs, is a transient along the northern border, on the basis of a single male taken by Orii in Pyongan Pukto 11 May 1929, which Yamashina (1932, 232) says "has a conspicuously pale color compared with those in Korea and Hondo".

Specimen records:

Pyongan Pukto	— 4 May 1917 (Kur); 24 Apr.-11 May 1929 (11) (Yam).
Pyongan Namdo	— 3, 7, 13, 14 Aug. 1931 (Won).
Kangwon Do	— 29 July 1929 (Yam); 5 Aug. 1930 (Won).
Kyonggi Do	— 18, 20 Sept. 1883 (3) (USNM); spring 1887 (Tacz); 13 May 1909 (2), 25, 28 Apr. 1911 (5) (LiWM); May 1925, 2 May 1927 (Mom); 27 Sept. 1927 (Taka); 10, 15 May 1925, Apr. 1929 (SoM); 18 Aug. 1928, 5, 15 Apr. 1929, 9 Apr. 1930 (Won); 29 Apr. 1932 (SSC); 16 May 1936 (Uch).
Cholla Namdo	— 24 Mar., 29 Apr. 1930 (Uch).
Kyongsang Namdo	— 27 Apr., 23 May 1884, 27 Apr. 1885, 27 Apr. 1886 (8) (USNM).

The Blue Flycatcher is a not uncommon summer resident in Korea, more abundant, however, during its spring migration. Taczanowski (1888, 465) says Kalinowski "met a lone female in spring". (He was speaking of the bird, of course.) Won (1934, 90) calls it common. Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. There is a Kyonggi Do nest and eggs in the LiWong collection taken 19 May 1910. Cumming (1933, 35) says "It is not very common in Korea but its striking colors and beautiful song seem to warrant the

inclusion in this list. It is usually seen in the woods of the mountain sides." Adachi (1941, 66) claims to have found it nesting in Hamgyong Pukto.

PRUNELLIDAE

299. Prunella collaris erythropygia (Swinhoe)

Accentor erythropygia Swinhoe., Proc. Zool. Soc. London, 1870, p. 124, pl. 9. (North China.)

English: North China Alpine Accentor.
Japanese: Iwa hibari (rock lark.)

Specimen records:

Hamgyong Pukto — 7 Nov. 1915 (SSC).
Hamgyong Namdo — 9 Oct. 1930 (Won).
Kyonggi Do — 30 Apr. 1911 (LiWM); 25 Dec. 1929, Nov. 1934 (SSC).

From the record this species seems to be a rare transient visitor and perhaps a rare resident in northern Korea. Won (1934, 94) calls it rare. The 1942 Hand-List says it breeds in Hamgyong Namdo, on the basis of the unpublished record of a fledgling collected there in the late nineteen-thirties by Mori and sent to Kuroda who (1947) still recalls identifying it, but does not remember what disposition was made of the specimen. It was not in his collection.

300. Prunella montanella (Pallas)

Motacilla montanella Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 695. (Dauria.)

English: Chinese Mountain Accentor.
Japanese: Yama hibari (mountain lark.)

Specimen records:

Hamgyong Pukto — 7 Nov. 1915 (SSC); 27 Oct. 1929 (Yam).
Hamgyong Namdo — winter 1887 (Tacz).
Pyongan Pukto — June 1917 (Kur).
Kyonggi Do — Dec., Jan., Feb. 1887 (Tacz); Jan. 1889 (Camp;) 24 Dec., 29 Mar. 1911, 6, 16 Jan., 29 Dec. 1913 (LiWM); 24 Apr. 1917, 23 Dec. 1924 (Kur); Mar. 1916, 15 Nov. 1925, 21 Nov. 1926 (Taka); Apr. 1926 (SoM); Feb. 1933, 27 Mar. 1936 (Uch).
Cholla Namdo — 27 Apr. 1930, 26 Feb. 1931 (Uch).

This species is an irregular, perhaps locally common winter visitor in the highlands. Taczanowski (1888, 463) calls it "common in winter, rare in summer", while Campbell (1892, 233) says "I have only seen this species in winter; it was fairly common". Won (1934, 94) considers it rare. Kobayashi (1931, 77) lists a sight record near Seoul, made in company with Mori on 30 March 1931. That it occurs at lower altitudes during migration is attested by the Kyonggi Do and Cholla Namdo specimens in the Uchida collection, which were light-house-killed birds from Hachibi and Shichihatsu islands sent in by Hashimoto. Hashimoto (1932) also observed the species at Shichihatsu Island 28 October 1930 and 23 March 1931.

MOTACILLIDAE

301. Anthus richardi richardi Vieillot

Anthus richardi Vieillot, Nouv. Dict. Hist. Nat., **26**, 1818, p. 491. (France.)
English: Richard's Pipit.
Japanese: Mamijiro tahibari (white-eyebrowed paddy-lark.)

Specimen records:

Pyongan Pukto — 4-12 May 1929 (6) (Yam).

This species is apparently a rare or uncommon spring migrant in northwestern Korea, perhaps of more regular occurrence than might be suspected from the specimen record. Yamashina (1929, 169) gives the only Korean records, as above.

302. Anthus campestris godlewskii (Taczanowski)

Agrodroma godlewskii Taczanowski, Bull. Soc. Zool. France, 1876, p. 128. (south Dauria.)
English: Blyth's Pipit.
Japanese: Ko mamijiro tahibari (small white-eyebrowed paddy-lark.)

Specimen records:

Kyonggi Do — 26 Sept. 1883 (USNM); 6, 7, June 1917 (LiWM).

Blyth's Pipit is but a straggler in Korea. Mori (1923, 40) lists a specimen in the exhibition collection taken in "Kyonggi Do?", but it

was possibly misidentified, for the species does not appear in Yamashina's holograph list of the Seoul Scientific Society and Seoul School collections.

303. Anthus hodgsoni Richmond

Anthus hodgsoni Richmond, Publ. Carn. Inst. Wash., **54**, 1907, p. 493. (China, *nom. nov.* for *Anthus maculatus* Jerdon.)

Anthus maculatus yunnanensis Uchida and Kuroda, Annot. Zool. Jap., **9**, 1916, p. 134. (Restricted type locality, Yunnan.)

English: Tree Pipit.

Japanese: Ki hibari (tree lark); Binzui (autochthonous, meaning is unclear, perhaps 'a follower'.)

Having seen insufficient material, I can but follow the Japanese treatment of this species. The 1942 Hand-List and Yamashina (1939, 477) delineate the breeding range of *A. h. yunnanensis* as extending from the Kurils and Sakhalin to northern Manchuria, and say that it occurs in Korea as a migrant or winter visitor. Hokkaido birds they consider as intermediate between this northern form and *A. h. hodgsoni*, the breeding race of Honshu and Korea. However, it should be pointed out that most of the Korean material is migratory, as the species has not been demonstrated definitely to breed there. As most of the Korean specimens have been judged inseparable from comparable Honshu birds, it follows that the breeding range of *hodgsoni* probably extends across southern Ussuri and southeastern Manchuria. The two races are a fine split at best, and the presence of indeterminable intermediates further complicates the problem when migrants are handled. The exact subspecific status of the Korean birds will not be settled satisfactorily until complete material is available from the breeding grounds.

Specimen records:

Hamgyong Pukto — 2 Aug. 1926 (im.) (Kur.); 9 Oct. 1929 (Yam); 29 July 1929 (Won).

Pyongan Pukto — 3 June 1917 (LiWM); 28 Apr.-11 May 1929 (11) (Yam).

Pyongan Namdo — 13 May 1917 (LiWM); 10 Oct. 1932 (2) (Won).

Hwanghae Do — 20 Apr., 1 May 1918 (2) (Taka).

Kyonggi Do — 2, 14 Oct. 1883 (USNM); 11 Oct. 1887 (Tacz); 22 Apr., 20 Dec. 1911, 2-29 Oct. 1916 (8) (LiWM); 15 Oct. 1917 (2) (Kur); 5 May 1918 (SSC); 15 Oct., 23 Nov. 1928, 9 Oct. 1929 (Won); 2 Oct. 1929 (SoM).

Cholla Namdo — 3 Oct. 1924, 11 May 1926, 27 Apr. 1930, 29 Apr. 1932 (Uch); 17 Jan. 1930 (Yam).

The Tree Pipit is a not uncommon spring and autumn transient, perhaps more plentiful in the northern highlands where it is thought to breed, and an occasional winter resident in the extreme south. Taczanowski (1888, 455) says "this bird is rare during migrations; small numbers in summer". Y. Kuroda and Miyakoda (1919) give its Seoul dates as March and early April, and October. Y. Kuroda (1935, 88) observed it in Chungchong Pukto 25 May 1931. Its breeding status is based on the evidence of Won, who (Kuroda and Mori, 1927, 292), having collected an immature at the foot of Paekto San in Hamgyong Pukto, says it breeds there. However, this bird may have been an early migrant from farther north.

Cumming (1933, 23) writes "This bird though called a tree pipit may often be seen down by the side of rocky streams in places where the wagtails are found and the nervous weaving motion of the tail reminds one of the other birds. In the woods it may be mistaken for the Forest Wagtail."

304. Anthus gustavi Swinhoe

Anthus gustavi Swinhoe, Proc. Zool. Soc. London, 1863, p. 90 (Amoy).
Anthus gustavi menzbieri Shulpin, Ann. Mus. Zool. Acad. Sci. URSS., 1927, p. 402. (South Ussuriland.)

English: Petchora Pipit.
Japanese: Sejiro tahibari (white-backed paddy-lark.)

Both the above races of the Petchora Pipit have been identified from Korea on migration. The two early specimens were ascribed to *gustavi*, which is evidently the commoner form. It was not until he examined Orii's large series that Yamashina (1932, 224) determined the presence of *menzbieri*, to which he also refers (1933, 274) two Shichihatsu specimens formerly in the Uchida collection but which are now missing.

Specimen records:

Anthus gustavi gustavi:
Hamgyong Pukto — 1-11 Oct. 1929 (5) (Yam).
Pyongan Pukto — 29 Apr.-3 May 1929 (7) (Yam).
Pyongan Namdo — 17 May 1934 (Won).
Hwanghae Do — 20 Apr. 1917 (SSC).
Kyonggi Do — 23 Sept. 1883 (USNM).

Anthus gustavi menzbieri:
Pyongan Pukto — 29 Apr.-3 May 1929 (4) (Yam).
Cholla Namdo — 20 May 1930, 17 Sept. 1931 (Uch).

The Petchora Pipit is an uncommon transient, more plentiful in the northern provinces on the edge of the mainland flight route. It is evidently only of casual occurrence farther south in the peninsula.

305. Anthus cervina (Pallas)

Motacilla cervina Pallas, Zoogr. Rosso-Asiat., **1**, 1811, p. 511. (Siberia.)
English: Red-throated Pipit.
Japanese: Mune akaku tahibari (red-throated paddy-lark.)

Specimen records:

Hamgyong Pukto — 17 Sept. 1917 (LiWM); 18 Apr. 1918 (Taka); 4, 8 Oct. 1929 (Yam).
Pyongan Pukto — 28 Apr.-4 May 1929 (11) (Yam).
Kangwon Do — 25, 29 Sept., 1 Oct. 1914 (5) (LiWM).
Kyonggi Do — 22 Apr. 1911, 13 May 1917 (LiWM); 10 May 1928 (SoM); 9 Apr., 8 May 1929 (Won); 8 May 1929 (SSC).

The Red-throated Pipit is another of the mainland migrants which occurs in northern Korea during its spring and autumn flights. Won (1934, 85) calls it common, which it seems to be during migration in the northern provinces. It is less common farther southward.

306. Anthus roseatus Blyth

Anthus roscatus "Hodgson," Blyth, Journ. As. Soc. Bengal, **16**, 1847, p. 437. (Nepal.)
English: Hodgson's Pipit.
Japanese: Chosen tahibari (Korean paddy-lark.)

Specimen records:

Kyonggi Do — 4 Nov. 1889 (Camp).
Cholla Namdo — 28 Oct. 1930 (Uch).
Korea — Jan. 1918 (2) (Taka).

Why the Japanese should call this species the "Korean Paddylark" is inexplicable, for in Korea it is a straggler of the first water, known only from the three widely scattered records listed above. Won (1934, 85) claims to have collected one at Kaesong, Kyonggi Do, but the 1942 Hand-List omits the record, and the data for such a specimen do not appear in the holograph list Won sent Yamashina.

307. Anthus spinoletta japonicus Temminck and Schlegel

Anthus pratensis japonicus Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 59, pl. 24. (Japan.)

English: Japanese Water Pipit.
Japanese: Ta hibari (paddy lark).

Yamashina (1930, 256) reports and the 1942 Hand-List accepts as a straggler *A. s. blackistoni* Swinhoe, from a single specimen collected by Orii in Kumwha, Kangwon Do, 1 December 1929. Yamashina comments "According to Mr. LaTouche, many of this subspecies live in the northern China in winter, so it is no cause for wonder that it was collected in Korea". I consider highly dubious the subspecific assignment of such an individual, far from its normal range, and within the range of another race of the same species, of which it may be simply an individual variant.

Specimen records:

Hamgyong Pukto	— 12-24 May 1912 (4) (AMNH); 26 Sept.-29 Oct. 1929 (11) (Yam).
Pyongan Pukto	— 3 May 1917 (Kur); 15 Apr.-3 May 1929 (6) (Yam).
Kangwon Do	— 11 Apr. 1914 (LiWM); 1 Dec. 1929 (Yam — see above.)
Kyonggi Do	— 21 Apr. 1889 (Camp); 15 Feb., 3 Nov. 1911 (LiWM).
Cholla Namdo	— 19 Feb. 1930 (Yam); 1 Oct. 1930 (Uch).
Kyongsang Namdo	— 6 Apr. 1917 (2) (Kur).

The Water Pipit is a not uncommon spring and autumn transient, more abundant, however, in the northern provinces which lie in the path of the mainland migration route than it is farther south. Campbell considered it (1892, 240) "very rare. This specimen is the only one I saw during my two years collecting." Won (1934, 85) calls it common, but does not list collecting it.

308. Motacilla alba Linné

Motacilla leucopsis Gould, Proc. Zool. Soc. London, 1837, p. 78. (India.)
Motacilla lugens Gloger, Isis, 1829, col. 771. (Kamchatka.)
Motacilla ocularis Swinhoe, Ibis, 1860, p. 55. (Amoy, China.)

English: Pied Wagtail.
Japanese: Haku sekirei (haku means "white", sekirei is autochthonous for all wagtails, but may mean "seat waver.")

The races of this species are so well marked and distinct there is very little difficulty in determining the subspecific identity of all but a very

few intermediates. My seven Kyonggi Do specimens are all *leucopsis*, the resident form, lacking the black eye-stripe of the Japanese subspecies, *lugens*, and without the black throat of the northern Siberian race, *ocularis*. As can be seen readily from the specimen record, if the original identifications of the old skins be accepted, *lugens* is of irregular occurrence in the southern half of the peninsula, while *ocularis* occurs fairly regularly as a not uncommon migrant in the north.

Specimen records:

Motacilla alba lugens:

Kangwon Do — 2, 5 Oct. 1914 (5) (LiWM).
Kyonggi Do — 29 Sept. 1883 (USNM); Mar., Apr., July [?] 1889 (Camp); 5 Oct. 1912 (SSC); 3 Oct. 1927 (Taka).
Cholla Namdo — 3 Mar. 1931 (Uch).

Motacilla alba ocularis:

Hamgyong Pukto — 17-27 Sept. 1929 (4) (Yam).
Pyongan Pukto — 28 Apr.-2 May 1929 (8) (Yam).
Kyonggi Do — Dec. 1887 (2) (Tacz); 17, 25 Oct. 1914 (4) (LiWM); 7 Nov. 1927 (Taka).

Motacilla alba leucopsis:

Hamgyong Pukto — 21 Apr. 1912 (AMNH); 23 Aug.-13 Sept. 1917 (8) (LiWM); 18 Apr. 1918, 2, 15, 21 Sept., 3 Oct. 1927 (Taka).
Hamgyong Namdo — 27 Apr.-9 May 1903 (6) (Roth).
Pyongan Pukto — June 1917 (Kur); 7-28 Apr. 1929 (9) (Yam).
Pyongan Namdo — 12, 13, 18 May 1917 (LiWM).
Hwanghae Do — 18 Mar. 1914 (LiWM).
Kangwon Do — 6-28 Sept. 1914 (9) (LiWM); 14 June 1929 (Yam).
Kyonggi Do — 20, 26 Sept. 1883 (USNM); Apr. 1887 (Tacz); July, Oct. 1889 (Camp); May 1909, Nov. 1910, 5 Apr. 1911, 5 July 1913, 20 June 1915 (LiWM); 18 Apr. 1919, 7, 29 Sept. 1932 (SSC); 13 Nov. 1910, 24 May 1927 (2) (Taka); 14 Aug. 1926, 20 Sept. 1927, 5, 19 May, 17 Sept., 5 Oct. 1929, 26 Aug. 1930, 14 Apr. 1932 (Won); 20 Apr., 6 May, 9, 10 Sept. 1929 (SoM); 9 Mar.-1 May 1946 (7) (MCZ).
Chungchong Namdo — 9 Apr. 1917 (Kur).
Cholla Namdo — 11 Apr. 1917 (Kur).
Kyongsang Namdo — 6 Apr. 1917 (2) (Kur).

Motacilla alba leucopsis is a common summer resident throughout plainsland Korea, and one of the first small landbirds to appear in spring. I saw the first arrivals in Suwon 9 March, feeding along the

narrow dykes of the flooded paddies at the edge of tidewater. A week later they became common farther inland, usually along the streams, frequently in the wetter rice fields. Campbell (1892, 240) notes "it affects rice-fields rather than running water". Kobayashi (1932) mentions its arrival in Hwanghae Do 21 March 1931.

The species probably rears two broods each spring in Korea. Kuroda (1918, 533) purchased a nest with five eggs taken near Seoul 10 June 1917. Yamashina (1932, 226) comments that a juvenal Orii collected in Pyongan Pukto had left its nest by the end of April, rather an early example.

309. Motacilla grandis Sharpe

Motacilla grandis Sharpe, Cat. Bds. Brit. Mus., **10**, 1885, p. 492. (Japan.)

English: Japanese Wagtail.

Japanese: Seguro sekirei (black-backed wagtail.)

Specimen records:

Chungchong Namdo — 4 Apr. 1917 (Kur).
Kyongsang Namdo — 18 Dec. 1914 (LiWM).

This straggler from the Japanese main islands is, according to Kuroda (1918, 533) "one of the rarest birds in Korea". In addition to the two specimens listed above, Mori (1923, 41) records one without date from Kyonggi Do in the Seoul Society collection, which was not found there by Yamashina's cataloguer, and which the 1942 Hand-List omits.

310. Motacilla cinerea caspica (S. G. Gmelin)

Parus caspicus S. G. Gmelin, Reise d. Russland, **3**, 1774, p. 104, pl. 20, fig. 2. (South coast of the Caspian Sea.)

English: Eastern Grey Wagtail.

Japanese: Ki sekirei (yellow wagtail.)

Specimen records:

Hamgyong Pukto — 15 Aug., 6, 17 Sept. 1917 (LiWM); 5, 6 Oct. 1927 (Taka); 26, 27 Sept. 1929 (Yam).
Pyongan Pukto — 9, 30 May 1929 (Yam).
Kangwon Do — 9, 13, 30 Sept. 1914 (LiWM); 27 Sept. 1916 (SSC); 16 June, 12 July 1929 (Yam).
Kyonggi Do — 7 Oct. 1883 (USNM); June 1887 (Tacz); 7 Apr. 1889

(Camp); Apr. 1911 (3), 27 June 1915 (LiWM); 22, 23 Apr. 1917 (3) (Kur); May 1927, 10 Sept. 1929 (SoM); 15 Apr. 1928, 14 Apr. 1929, 20 Sept. 1930, 28 Apr., 10 May 1932 (Won); 9 May 1934 (Uch); 14, 24 Apr. 1946 (MCZ).

Cholla Namdo — 13 Nov. 1926, 23 Mar. 1931, 7 May, 2 Sept. 1932 (Uch).

The Grey Wagtail is a common spring and autumn transient. It is doubtfully a summer resident in the north. Taczanowski (1888, 464) says "common, nests, leaves for winter". Campbell (1892, 239) writes "A summer visitor. I have occasionally noticed the Grey Wagtail in small bands of half a dozen on the banks of shallow streams." Y. Kuroda and Miyakoda (1919) give its season in Seoul as from early April to late October, adding "nest not yet found, but we often see young with yellow at the base of the bill, so they seem to nest near by." Y. Kuroda (1935, 88) also observed it in Chungchong Pukto 25 May 1921. Won (1934, 85) says it is common, but makes no mention of its breeding. Both Yamashina (1933, 297) and the 1942 Hand-List admit no proof of nesting. The two I collected were each feeding alone along the stream running out of Suwon lake, and were the only ones I encountered.

311. Motacilla flava Linné

Budytes taivanus Swinhoe, Proc. Zool. Soc. London, 1863, p. 334. (Formosa.)

Motacilla flava simillima Hartert, Vög. pal. Fauna, **1**, 1905, p. 289. (Kamchatka, Korea, China, etc.)

Budytes flava macronyx Stresemann, Avif. Macedon., 1920, p. 76. (Vladivostok.)

English: Grey-headed or Yellow Wagtail.

Japanese: Tsumenaga sekirei (long toe-nailed wagtail.)

Having no new material, I can but follow the 1942 Hand-List, which in turn follows Yamashina's (1933, 288) excellent analysis of the eastern races of this plastic and difficult species. He gives *simillima* as breeding in northeastern Siberia and the northern Kurils, *taivana* as from central Siberia easterly to Sakhalin, and *macronyx* as the most southerly, nesting in Ussuriland and on both banks of the Amur River. All three races have been taken on migration in Korea, together with intermediates impossible of accurate subspecific assignment.

Specimen records:

Motacilla flava macronyx:

Hamgyong Pukto — 2, 7 Sept. 1917 (LiWM); 18 Apr. 1918 (Taka); 20 Sept. 1929 (Yam).

Pyongan Pukto — 7-16 Apr. 1929 (10) (Yam).
Pyongan Namdo — 20 Apr. 1918 (Taka).
Kangwon Do — 4 Apr. 1914 (LiWM).

Motacilla flava simillima:
Hamgyong Pukto — 26 Apr. 1912 (AMNH); 17, 18 Sept. 1929 (Yam).
Pyongan Pukto — 8 May 1929 (Yam) (intermediate).
Pyongan Namdo — 12, 13 May 1917 (LiWM); 14 May 1917 (SSC).
Kangwon Do — 17 Sept.-2 Oct. 1914 (8) (LiWM).
Cholla Namdo — 3 Oct. 1924, 13 Sept. 1926, 17 Sept. 1931 (Uch).
Kyongsang Namdo — 23 Sept. 1885 (USNM).

Motacilla flava taivana:
Pyongan Pukto — 2 May 1929 (Yam).

The Yellow Wagtail is a mainland migrant, a common spring and autumn transient in the northern provinces of Korea. It seems occasionally to follow the eastern coastline of the peninsula in its southward flight, but has never been taken on the west coast south of Pyongan Namdo. Most of the Korean specimens are of one or the other of the two eastern subspecies, *macronyx* and *simillima*, and there is but the one definite record for the central Siberian *taivana*. From the collection dates of Orii's specimens from Pyongan Pukto, Yamashina (*idem*) deduces that the three races migrate through northern Korea at different times, *macronyx* in mid-April, *taivana* in late April and early May, and *simillima* from the first to the twentieth of May.

312. Dendronanthus indicus (Gmelin)

Motacilla indica Gmelin, Syst. Nat., **1**, pt. 2, 1789, p. 962. (India.)
English: Forest Wagtail.
Japanese: Iwami (province name) or Yokofuri sekirei (sideways-swinging-wagtail.)

Specimen records:

Pyongan Pukto — 9-17 May 1929 (4) (Yam).
Kangwon Do — 13 June-4 July 1929 (6) (Yam).
Kyonggi Do — 2-29 June 1883 (7) (USNM); June 1887 (3) (Tacz); May 1889 (2) (Camp); 23 May 1911, 8 June 1913, 30 May 1914 (LiWM); 5 May 1912 (SSc); 10 July 1927, 5 May 1928, 13 Oct. 1930, 2 May 1931, 5 July 1932 (Won); May 1929 (2) (SoM).
Cholla Namdo — 1 Sept. 1924 (Uch).

The Forest Wagtail is a not uncommon summer resident in the forested areas of Korea. It was one of the first species recorded from Korea, collected "on a sand spit" somewhere along the coast by the "Flying Fish" expedition (Tristram, 1885, 195). Taczanowski (1888, 464) found it "common, nests, leaves for winter". Campbell (1892, 237) just calls it a "summer visitor". Cumming (1933, 26) writes "This bird is always found in the woods, usually in the higher hills. It is very shy and were it not for its oft repeated frightened-sounding cry it would not be easily seen. The movements of the tail are almost continuous, a sort of weaving-around motion very different from the flirting tail movements of the redstart for instance. It is fairly well distributed over the country, in mild winters staying the year round in southern Korea." Won (1934, 85) calls it common and breeding. He collected a nest with five eggs, now in the Yamashina collection, in Pyongan Namdo, 3 June 1938.

BOMBYCILLIDAE

313. Bombycilla garrulus centralasiae Poljakov

Bombycilla garrulus centralasiae Poljakov, Mess. Orn., 1915, pp. 137, 138. (Altai, Turkestan.)

English: Eastern Waxwing.
Japanese: Ki renjaku (yellow waxwing.)

Specimen records:

Hamgyong Pukto — 7 Nov. 1915. (SSC).
Pyongan Namdo — 19, 20, 21, 23 Jan., 9 Feb. 1931 (Won).
Kyonggi Do — 9 Dec. 1910 (LiWM); 5 May 1912 (SSC); 15 Mar. 1928 (USNM); Jan. 1924, 20 Dec. 1927, 22 Feb. 1928 (Taka); 7 Apr. 1929 (Won); 16 Mar. 1932 (3) (SoM).

The Eastern Waxwing is an irregular and uncommon winter visitor. Taczanowski (1888, 459) "observed [it] in February at Songdo [Kyonggi Do]". Y. Kuroda and Miyakoda (1919) give the same data in their migration chart for both waxwings, as occurring in Seoul from February to early April and in October and November, which agrees with the specimen record in neither case. Won (1934, 88) says it is "common, passes through in spring and autumn, flying in flocks".

314. Bombycilla japonica (Siebold)

Bombicivora Japonica Siebold, De hist. nat. in Japon. statu etc., 1824, p. 13. (Higo and Chikuzen, Japan.)

English: Japanese Waxwing.
Japanese: Hi renjaku (scarlet waxwing.)

Specimen records:

Kyonggi Do — May 1909, 8 Mar. 1911 (2) (LiWM); 22 Apr. 1917 (Kur); 17 Jan. 1916, 6 Mar. 1930 (SSC); May 1926 (2) (SoM); 23 Mar. 1927 (2) (Taka); 9 Apr., 1 May 1929 (Won).

The Japanese Waxwing is an irregular and uncommon spring transient in Korea. It was first recorded there by Campbell (1892, 239) who says "A band of these pretty Waxwings visited Söul in the spring of 1890. I identified one which was sent to me . . . M. Kalinowski did not obtain a specimen of this bird, and though it should be very conspicuous, I never observed it myself." Kuroda (1918, 546) says "I have seen a group of some ten birds of the species [in Kyonggi Do]". Won (1934, 88) says it is a rare migrant and flies in a flock. Kobayashi (1931, 78) in company with Mori, saw thirty waxwings near Seoul 30 March 1931, which he attributes to this species.

LANIIDAE

315. Lanius sphenocercus sphenocercus Cabanis

Lanius sphenocercus Cabanis, Journ. f. Orn., 1873, p. 76. (Canton, China.)

English: Great Grey Shrike.
Japanese: O kara mozu (large shrike of old China.)

Specimen records:

Hamgyong Pukto — Feb. 1918 (Taka); 20 Aug., 6, 7, 18 Sept. 1929 (Yam).
Pyongan Pukto — late Apr. 1917 (Mori).
Hwanghae Do — 25 Oct. 1911 (2) (Kur); 5 Dec. 1929 (Won); 16 Oct. (SoM).
Kangwon Do — 3 Oct. 1911 (2), 12 Apr. 1914 (LiWM); 9 Oct. 1911 (Kur); 29 Sept. 1912 (SSC); 3 Apr. 1917 (Taka); 25 Nov., 1 Dec. 1929 (Yam).

Kyonggi Do — 28 Sept., 16, 18, 21 Nov. 1883 (USNM); Dec., Feb. 1887 (Tacz); 20 Sept., 21 Nov., 22 Dec., 9 Feb. 1888–9 (Camp); Nov.-Dec. 1909, 24 Mar. 1910 (LiWM); Nov. 1911, 12 Feb. 1919, 23 Dec. 1927 (Taka); 16 Nov. 1928 (Won); 9 May 1934 (Uch); 26 Dec. 1934, 11 Jan. 1946 (MCZ).
Kyongsang Namdo — 19, 26, 27 Dec. 1914 (LiWM).

The Great Grey Shrike is a not uncommon winter visitor throughout Korea, and perhaps a rare summer resident in the mountains of Hamgyong Pukto. Taczanowski (1888, 464) calls it "resident, more numerous in winter than in summer". Campbell (1892, 239) observed it near Seoul "at all seasons". Won (1934, 88) says it is uncommon, but breeds "distributed in a limited area". Both Yamashina and the 1942 Hand-List say it breeds in Korea, but there is no indication of it, beyond Orii's late August specimen.

The specimen I collected in January contained the remains of a line-backed mouse, *Apodymys*. I saw two others in February.

316. Lanius bucephalus bucephalus Temminck and Schlegel

Lanius bucephalus Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1844, p. 39, pl. 14. (Japan.)

English: Bull-headed Shrike.
Japanese: Mozu (autochthonous.)

Specimen records:

Hamgyong Pukto — 22 Oct. 1929 (Yam).
Hamgyong Namdo — 6 Mar. 1914 (LiWM).
Pyongan Pukto — 5 Apr. 1929 (2) (Yam).
Pyongan Namdo — 23 May 1932 (Won).
Kangwon Do — 15 June 1929 (Yam).
Kyonggi Do — Mar. 1887 (Tacz); Mar. 1889 (Camp); Feb. 1910, 28 Mar. 1911, 8 Feb. 1914, 14 Aug. 1915, 1 Jan. 1916 (LiWM); 1 July 1912 (SSC); 8 Dec., 19 July 1927, 2 Apr. 1930 (Taka); 3, 9 July 1927 (Won); Oct. 1928 (SoM); 1 Jan., 27 Apr. 1946 (MCZ).
Cholla Pukto — 31 Dec. 1911 (LiWM).
Cholla Namdo — 15 Sept. 1925, 30 Apr. 1930, 10 May, 16 Aug. 1931, 2 Sept. 1932 (Uch), 11 Dec. 1929-24 Feb. 1930 (5) (Yam).

The Bull-headed Shrike is a not uncommon resident, wintering from Kyonggi Do southward and summering in the northern half of Korea. Taczanowski (1888, 464) says "quite common in summer, nests, absent in winter". Campbell, on the other hand (1892, 238) found it "not a common bird". Won, Yamashina, and the 1942 Hand-List all give it as breeding in Korea, but again, there is no evidence other than the summer collecting records. Highly questionable is Y. Kuroda and Miyakoda's statement (1919) that it "builds its nests here and there in Seoul". They give its season there as from May through October.

I found this shrike a not uncommon winter resident in the vicinity of Suwon. I saw one 20 December, and collected one the first of January. I saw another 26 January, and two more in February. On 5 March one chased a flock of Rustic Buntings into my bird net, and got caught itself, but escaped just as I reached up to remove it. The species became more common in mid-April, and a marked wave passed through between 20 and 25 April, during which I saw two or three daily. It is a comparatively shy bird, and I was only able to collect one more, a female on 22 April.

317. Lanius tigrinus Drapiez

Lanius tigrinus Drapiez, Dict. Class. Hist. Nat., **13**, 1828, p. 523. (Java.)

English: Thick-billed Shrike.

Japanese: Chigo mozu (little child shrike.)

Specimen records:

Pyongan Pukto	— 31 May, 8 June 1917 (3) (LiWM); 23 Sept. 1917 (Taka); 17-26 May 1929 (9) (Yam).
Pyongan Namdo	— 17 May 1930 (SSC); undated (Kur).
Kangwon Do	— 16 June 1929 (Yam).
Kyonggi Do	— May 1888 (2) (Camp); 8 June 1913 (2), 30 May 1914 (2) (LiWM).
Cholla Namdo	— 20 May, 28, 30 Aug. 1930, 2, 17 Sept. 1931 (Uch).
Kyongsang Namdo	— 22 May 1886 (USNM).

The Thick-billed Shrike, from the specimen record, appears to be an uncommon late spring and early autumn migrant in Korea. Campbell (1892, 238) says "I shot a pair of this species, which was rare in my experience, in May 1888 near Söul". Yamashina (1933, 440) perhaps basing his thought on Orii's June collecting date, says it breeds in Korea, a conclusion not endorsed by the 1942 Hand-List.

318. Lanius cristatus Linné

Lanius lucionensis Linné, Syst. Nat., ed. 12, **1**, 1766, p. 135. (Luzon.)
Lanius cristatus confusus Stegmann, Journ. f. Orn., **77** (2), 1929, p. 248. (Upper Amur.)

English: Red-tailed Shrike.
Japanese: Aka mozu (red shrike.)

The 1942 Hand-List records the north Siberian race, *L. c. cristatus* as occurring in Korea, apparently on the basis of a specimen from northern Korea in the former Kuroda collection, which can no longer be verified. The local breeding form is *lucionensis*, and the Amur and upper Manchuria subspecies, *confusus*, occurs as a rare transient in the northern provinces, as shown by the Yamashina and Kuroda specimens.

Specimen records:

Lanius cristatus confusus:
Hamgyong Namdo — no date (Wonsan) (Kur).
Pyongan Pukto — 11, 21 May 1929 (Yam).

Lanius cristatus lucionensis:
Hamgyong Pukto — 26 July 1929 (Yam).
Hamgyong Namdo — 24 July 1886 (USNM).
Pyongan Pukto — 26 May, 7 June (3) 1917 (LiWM); June 1917 (Kur); 11-24 May 1929 (11) (Yam).
Pyongan Namdo — 4 Sept. 1911 (Kur); 20 May 1917 (LiWM); 13, 15 May, 30 June 1931 (Won).
Kyonggi Do — 5 June-31 July 1883 (5) (USNM); May, June 1887 (4) (Tacz); May, June, July 1889 (9) (Camp); 10 June 1914 (SSC); 8, 12 June 1909 (3), 30 May 1914 (LiWM); 3, 9 July 1927 (Won); 9 July 1927, 13 May 1931 (AMNH).
Cholla Namdo — 24 Apr. 1932, 16 Aug. 1933 (Uch).
Kyongsang Namdo — 17 May (2), 9 July (2), 14 Dec. 1884 (USNM).

The Red-tailed Shrike is a common summer resident throughout Korea; a few winter in the southern provinces. Taczanowski (1888, 464) says "commoner in summer [than *L. bucephalus*], lacking in winter". Campbell found it (1892, 239) "very common in summer". Won (1934, 88) calls it "the most numerous of the shrikes, widely distributed, breeds". Cumming (1933, 30) writes "its loud quarrelsome call may be heard throughout the year in the southern parts of the country. However, it is rare in the breeding season and it is probable that the birds seen in winter are those which have spent the summer

farther north and have thus moved down with the season. . . . this species is very valuable as a destroyer of the larger beetles and insects of all kinds, and though it is very noisy, I have never seen it fighting other birds unless in defense of its nest. In strange contrast with its call is the quiet musical little song which may be heard at rare intervals, chiefly during the breeding season". There are two sets of nests and eggs in the LiWong Museum, taken in Kyonggi Do 20 and 24 May 1910 respectively. Yamashima (unpublished ms.) collected a nest with six eggs 16 June 1936, in Kangwon Do. The species had not appeared at Suwon when I left there in early May.

STURNIDAE

319. Spodiopsar cineracea (Temminck)

Sturnus cineraceus Temminck, Pl. Col., livr. 94, 1835, pl. 556. (Japan.)

English: Grey Starling.

Japanese: Mukudori (bird of the 'muku tree', *Aphanantha aspera*.)

Specimen records:

Hamgyong Pukto — 22 Apr. 1912 (AMNH); 18 Aug. 1917 (2) (LiWM); 25 Apr. 1918 (Taka); 15 Mar. 1929 (Won); 28 July 1929 (Yam).

Pyongan Pukto — 11 Apr.-28 May (6) (Yam).

Pyongan Namdo — 20 Apr. 1931 (SoM); 23 Apr. 1931, 15 Apr. 1932, 31 Mar. 1933 (Won).

Hwanghae Do — 21 Mar. 1914 (2) (LiWM); 3 Apr. 1934 (SoM).

Kangwon Do — Apr. (Kur).

Kyonggi Do — 14 Jan. 1883 (2) (USNM); Apr. 1887 (Tacz); Apr. 1889 (Camp); 1 May 1909, 12 Apr. 1911, 31 Nov. 1914 (LiWM); 4 June 1919 (Kur); 22 Aug. 1929 (Won); 25 Feb. 1930 (2) (Taka); 4 Apr. 1934 (Uch); 26 June 1935, 8 Feb., 11 Apr. (3) 1946 (MCZ).

Cholla Namdo — 1 June 1928, 24 Apr. 1932 (Uch).

Kyongsang Pukto — 27 Mar. 1916 (SSC); 15 Sept. 1923 (Uch).

The Grey Starling is a common spring and autumn transient, apparently more abundant during the spring migration. A few winter from Kyonggi Do southward. Campbell (1892, 239) says "very numerous in spring". Won (1934, 80) says "many pass through Korea in spring, flying in flocks".

I saw one at Suwon 28 December 1945, but collected the first winter straggler 8 February 1946. The first spring arrivals were a compact little flock of 15 birds feeding in the paddies near salt water 23 March, but they did not appear in numbers until early April. Throughout that month, however, I observed them frequently in the large pines at the edge of the forest south of Suwon. Usually they were in loose flocks of from six to thirty birds, staying in the cover of the tops of the taller trees, and feeding along the larger high branches.

There is no definite record of the species' breeding in Korea, and though Yamashina (1933, 55) lists Korea as part of its breeding range, the 1942 Hand-List gives it just as occurring. While some of the June and August specimen records of adults are suggestive and tempting, there is no evidence that it nests south of Manchuria. No subsequent authority has given credence to Y. Kuroda and Miyakoda's (1919) statement that it "occasionally nests in the eaves of big buildings in Seoul".

320. Sturnia sturnina (Pallas)

Gracula sturnina Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 695. (Dauria.)

English: Daurian Myna.

Japanese: Shiberiya mukudori (Siberian starling.)

Specimen records:

Hamgyong Pukto — May 1928 (3) (SSC).

Pyongan Pukto — 18-27 May 1929 (10) (Yam); May 1934, July 1937, 6 June 1940 (Won).

The Daurian Myna is a not uncommon summer resident in the two northern border provinces. Won (1941, 91) first saw it in Pyongan Pukto in May 1934, and recorded single birds annually until July 1937, when he saw a female feeding a newly-fledged juvenal. He observed six adults in May 1940, and found a nest in a hole in a tree 30 May 1940, which he watched assiduously for a week, finally collecting both parents and the clutch of three eggs on 6 June 1940. He notes that both sexes share the incubation duties. Later the same month he watched a second pair evidently preparing to nest in another site, from which they first removed the old nest before starting to carry in new material. He was unfortunately unable to complete his observations. Adachi (1941, 66) found it nesting in Hamgyong Pukto, and notes that it lays from three to five eggs in a hollow tree.

321. Sturnia philippensis (Forster)

Motacilla philippensis Forster, Indian Zool., 1781, p. 41. (Philippines.)
English: Red-cheeked Myna.
Japanese: Ko mukudori (small starling.)

Specimen records:

Hamgyong Pukto — 15 Oct. 1927 (SSC).
Pyongan Pukto — 17 May 1934 (Won).

This species is a straggler from the southward, having been taken but twice. Mori (1929, 104) reported the first specimen, from Nanam, Hamgyong Pukto. Won never published the data on his Pyongan Pukto bird, but included it in the holograph list he sent Yamashina.

ZOSTEROPIDAE

322. Zosterops palpebrosa ijimae Kuroda

Zosterops palpebrosa ijimae Kuroda, Tori, **1** (5), 1917, p. 4, pl. 6, fig. 3, text figs. 2, 3. (Tsushima.)
English: Ijima's White-eye.
Japanese: Iijima mejiro (Ijima's white-eye.)

Specimen records:

Cholla Namdo — 14 Apr. 1917 (Kur).
Kyongsang Namdo — 12 Oct. 1884 (USNM); Sept. 1917, 31 May, Aug. 1918, 17 Dec. 1928 (2) (Kur).

The 1942 Hand-List gives this race as breeding in Cholla Namdo and Kyongsang Namdo, the two southernmost provinces. It is more likely that the species occurs there simply as a casual spring and autumn transient en route between its southern wintering grounds and its nearest known breeding places on Dagelet and Tsushima Islands. Hashimoto gives a number of sight records for White-eyes from his light-house stations, usually listing "several". He observed it (1932) at Shichihatsu Island in Cholla Namdo 23 March and 8 May 1931, and 4, 15 April 1932. He also records it (1934) from Hachibi Island in Kyonggi Do 7-15 May 1933 and 30 Sept. 1934.

323. Zosterops erythropleura erythropleura Swinhoe

Zosterops erythropleura Swinhoe, Proc. Zool. Soc. London, 1863, p. 204. (North China.)

English: Red-flanked White-eye.
Japanese: Ko mejiro (small white-eye.)

Specimen records:

Pyongan Pukto — 8 July 1917 (LiWM); 16 May 1929 (2) (SSC).
Pyongan Namdo — 23 May 1933 (2) (Kur).

This species is either a rare migrant or a summer straggler in northwestern Korea. Won, who collected the pair in the Kuroda collection says (1934, 86) "a few pass through in spring and autumn, flying in a flock".

PLOCEIDAE

324. Passer montanus dybowskii Domaniewski

Passer montanus orientalis Clark, Proc. U. S. Nat. Mus., **38**, 1910, p. 69. (Hokkaido and Korea.) (partim.)

Passer montanus dybowskii Domaniewski, Compt. Rend. Soc. Sci. Varsovie, **8**, 1915, fasc. 7, pp. 562, 566. (Ussuri and Korea.)

English: Ussurian Tree Sparrow.
Japanese: Chosen suzume (Korean sparrow.)

This is the common, door-yard bird of Korea, an abundant permanent resident everywhere despite constant persecution from children and adults alike. I omit the specimen record as unnecessary; there are numerous skins, from almost every province and for every month of the year, wherever birds have been collected in Korea. My series of fourteen specimens was collected in Seoul and Suwon between 22 November 1945 and 8 April 1946.

The best popular account is that of Cumming (1933, 19) who writes: " . . . easily the commonest bird in Korea. It may be found around the villages all the way from the seaside to the remotest mountain valleys, ubiquitous and assured. It becomes during the harvest season more or less of a pest as it gathers in large flocks to feed in the rice fields. It is then that the farmers hang their long strings of paper streamers or tin cans over the ripening grain that the birds may be frightened away by the noise or the waving paper. Everyone has heard the cries of the

watchers, old men and women or children set to keep the birds from feeding on the rice." He omits mention of the strings of them you see hanging in the markets through the winter, their heads shoved between the twists of a piece of rice-straw rope. As I did not care to waste precious ammunition on them, most of my specimens were caught for me by my house-boy, who simply picked them by hand off their roosts in the shrubbery after dark with the aid of my flash-light.

There are no details available on the nesting of the species in Korea. Kobayashi (1931) noted them on 19 March 1930 "building in the sides of a stork's nest, fifty feet high on top of a tree" in Hwanghae Do. Their usual nesting site, however, is under the eaves and in the thatched roofs of the Korean dwellings. Two sets of eggs in the LiWong collection are labelled Kyonggi Do, 25 May and 30 May 1910, respectively.

325. Passer rutilans rutilans (Temminck)

Fringilla rutilans Temminck, Pl. Col., livr. 99, 1835, pl. 588, fig. 2. (Japan.)

English: Russet Sparrow.

Japanese: Niunai suzume (go-inside sparrow.)

Specimen records:

Kangwon Do — 8 Oct. 1914 (LiWM); 13-27 June 1929 (8) (Yam).
Kyonggi Do — 23 Apr. 1917 (Kur).
Chungchong Pukto — 9 Feb. 1918 (2) (Kur).
Kyongsang Namdo — 24, 25 Dec. 1914 (4) (LiWM).

The Russet Sparrow is an uncommon, perhaps locally common, summer resident. A few may winter in the extreme south, and it seems to be far more plentiful on the east coast than on the west. Y. Kuroda (1918, 21) gives a sight record for a flock of twenty birds in Kangwon Do on 25 July. Adachi (1941, 66) says it occupies nesting boxes in Hamgyong Pukto, laying three to five eggs in a nest of leaves.

FRINGILLIDAE

326. Coccothraustes coccothraustes (Linné)

Coccothraustes vulgaris japonicus Temminck and Schlegel, in Siebold's Fauna Jap., Aves, 1847, p. 50, pl. 51. (Japan.)

Coccothraustes coccothraustes verticalis Buturlin, in Buturlin and Tugarinow, Materialy po ptitsam Yeniseiskoï Gubernii, 1911, p. 88. (Yenissei.)

English: Hawfinch.

Japanese: Shime (autochthonous.)

As *C. c. japonicus* breeds from Hokkaido to Manchuria, Yamashina (1939, 462) assumes that those which breed in northern Korea must also belong to this subspecies, a logical conclusion in which he is followed by the 1942 Hand-List. However, the only summer Korean specimen is a juvenal which (Yamashina, 1932, 218) had just left its nest, and is hence too young for subspecific determination. Adults of this southern form have never been taken in Korea. All the migrant and wintering specimens have been referred to the northern race, *verticalis*, with darker back and scapulars than *japonicus*.

Specimen records:

Coccothraustes coccothraustes japonicus:
Hamgyong Pukto — 28 July 1929 (Yam) (juv.).

Coccothraustes coccothraustes verticalis:
Hamgyong Pukto — 27 Oct.-12 Nov. 1929 (3) (Yam).
Pyongan Pukto — 26 Nov. 1926 (Taka).
Kyonggi Do — Apr. 1887 (Tacz); Jan., Feb., Mar. 1889 (Camp); Nov. 1909, Mar. 1910, 1 Jan. (3), 26 Apr., 3 Dec. 1911 (LiWM); 20 Jan. 1926 (2) (Kur); 13, 25 Dec. 1926 (Taka); 5 Jan., 11, 26 Nov., 21 Dec. 1929 (Won); Dec. 1925 (SoM); 20 Jan. 1930 (SSC).
Chungchong Namdo — 12 Dec. 1917 (SSC).
Cholla Namdo — 25 Dec. 1929 (3) (Yam).
Kyongsang Namdo — 7, 14 Dec. 1884, 11 Apr. 1886 (USMN).

The Hawfinch is a locally common but irregular winter visitor throughout Korea, and a rare summer resident in the north. Campbell (1892, 240) calls it "very numerous in winter". Y. Kuroda and Miyakoda (1919) chart its Seoul season as from October to early March. Kobayashi (1931) saw Hawfinches in Hwanghae Do 24 March and in Kyonggi Do 30 March 1931. Won (1934, 80) calls it a common winter visitor. Its presence as a summer resident is based on Orii's juvenal (see above) from the highlands of Hamgyong Pukto, and on a nest and eggs in the Kobayashi collection from Hwanghae Do. Kobayashi (1933, 67) writes "In Hwanghae Do, Korea, nests are mostly in boughs of tall chestnut trees . . . The principal material for the outside structure is dead grass, with which is mixed waste cloth and waste thread. For the inside part a large quantity of rootlets are used. This . . . is a comparatively crude structure."

327. Eophona personata magnirostris Hartert

Eophona personata magnirostris Hartert, Bull., B.O.C., **5**, 1896, p. 38. (Siberia: Amur Bay.)

English: Large-billed Japanese Grosbeak.
Japanese: Ikaru (autochthonous, perhaps from the voice.)

Specimen records:

Pyongan Pukto — 26 May 1917 (LiWM).
Pyongan Namdo — undated (Won).
Kyonggi Do — 9 Jan. 1918 (SSC).
Cholla Namdo — 26 May 1926 (Uch).

This species is a straggler in Korea. The Kyonggi Do specimen was picked out of a string of dead Hawfinches in the Seoul market by Mori (1918, 53) and identified by Kuroda. The Pyongan Namdo specimen was bought by Won (1934, 81) "from a farmer who had been breeding it near Anju. It died after I kept it six months. The mounted specimen is now in the Anju Agricultural School." The Cholla Namdo bird, identified by Uchida, was received in Tokyo in the flesh from Shichihatsu Island, in such bad condition it could not be preserved.

328. Eophona migratoria migratoria Hartert

Eophona melanura migratoria Hartert, Vög. pal. Fauna, **1**, 1903, p. 59. (Sidemi, Ussuri.)

English: Migratory Chinese Grosbeak.
Japanese: Ko ikaru (small grosbeak.)

Specimen records:

Hamgyong Pukto — 23, 24 Aug. 1917 (4) (LiWM).
Pyongan Pukto — 26 May-19 June 1917 (6) (LiWM); 9-20 May 1929 (11) (Yam).
Pyongan Namdo — 8 May 1931, 22 Sept. 1932, 24 May 1934 (Won).
Kangwon Do — 8 Sept. 1914 (2) (LiWM).
Kyonggi Do — 26 Aug. 1887 (Tacz); July 1889 (2) (Camp); 7 May 1909 (2), 8 June 1913 (2) (LiWM); 20 Dec. 1913 (SSC); 16 May 1928, 2 July 1927, 25 May 1931 (SoM).
Cholla Namdo — 24 Feb. 1930 (Yam).

This grosbeak is a not uncommon summer resident in the northern half of Korea. It is plentiful in migration at times along the northern border, and occasionally winters in the south. Campbell (1892, 240)

collected two immature males in July at Inchon, and calls it rare. Won (1934, 80) says it is common, and breeds in Kyonggi Do and Pyongan Namdo. There is a nest and set of eggs in the LiWong collection labelled "Ikaru, Kyonggi Do, 23 May 1909", and another nest with two eggs in the Yamashina collection taken by Wong in Pyongan Namdo, May 1935.

329. Chloris sinica ussuriensis Hartert

Chloris sinica ussuriensis Hartert, Vög. pal. Fauna, **1**, 1903, p. 64. (Sidemi, Ussuri.)

English: Ussurian Greenfinch.
Japanese: Kawarahiwa (riverside finch.)

Specimen records:

Hamgyong Pukto — 17 Sept. 1917 (LiWM).
Hamgyong Namdo — 27 Apr.-10 May 1903 (14) (Roth).
Pyongan Pukto — 6 June 1917 (2) (LiWM); 4 Apr.-29 May 1929 (10) (Yam).
Kangwon Do — 15 June-13 July (1 ad., 2 im.), 23, 26 Nov. (5) 1929 (Yam).
Kyonggi Do — 10, 12, 25 June, 27 Oct. 1883 (USNM); Jan., May 1889 (Camp); 24, 25 Mar. 1910 (4), 25 Apr. 1911, 27 June 1915 (3) (LiWM); 13 June 1912, 10 May 1927 (SSC); 23 Apr. 1917 (2) (Kur); 5 Oct. 1927, 26 Jan. 1928 (7) (Taka); 20 Apr. 1927, 12 May 1929, 3 Apr., 26 Oct. 1932 (Won); 28 Dec. 1927, 22 Mar. 1930, 29 Nov. 1945-17 Apr. 1946 (9) (MCZ).
Kyongsang Pukto — 19 Jan. 1924 (Uch).

The Greenfinch is a common resident throughout Korea. Y. Kuroda and Miyakoda (1919) say that in the Seoul region from November through April it "makes big flocks. Pairs of birds often found in summer. It seems to nest." A nest and eggs in the LiWong Museum labelled "Aoji, Kyonggi Do, 20 May 1910" is of this species, not *Emberiza spodocephala*.

I found it an abundant winter resident in the Suwon area, most frequently seen on the dry banks of the sheltered river bottoms. It is one of the few small birds that tends to remain in cohesive flocks, and the only winter bird to perch in long rows on the telephone wires. The flocks remain together from December through February, sometimes as many as three hundred individuals in each. I heard the first notes of its spring song 8 February. Toward the end of that month the

flocks began to split up as the birds paired off. By mid-March it was unusual to see more than a dozen together. Away from the river bottoms I found it most frequently in wooded patches containing alder and willow, feeding on the catkins.

330. Carduelis spinus (Linné)

Fringilla Spinus Linné, Syst. Nat., ed. 10, **1**, 1758, p. 181. (Sweden.)
English: Siskin.
Japanese: Ma hiwa (true finch.)

Specimen records:

Hamgyong Pukto — 22 Oct.-11 Nov. 1929 (5) (Yam).
Pyongan Pukto — Apr. 1917 (SSC).
Kyonggi Do — Dec., Apr. 1887 (9) (Tacz); Jan. 1889 (Camp); Dec. 1909, Feb. 1910, 12 Apr. (4), 20 Dec. 1911, 1 Dec. 1913 (2) (LiWM); 20 Apr. 1914, 1 July 1916, (SSC); 10, 22 Oct. 1926, 20 Apr., 2 May 1927, 21 Jan. 1928 (Taka); Apr. 1927, 19 Apr. 1930 (2) (SoM); 2 Mar. 1929 (Won).
Cholla Namdo — 17 Jan.-23 Feb. 1930 (5) (Yam); 27 Apr. 1930 (6) (Uch).

The Siskin is a common but irregular winter visitor, usually appearing in abundance in alternate years. Taczanowski (1888, 466) says "common in spring, rare in summer". Cumming (1933, 18) writes "it may be seen in winter feeding in flocks through the woods or on grassy slopes. Habits are similar to those of the greenfinch." Won (1934, 81) calls it a common winter visitor. The winter of 1945–46 was evidently one of its off years, for though I looked for it constantly, I never found it.

331. Acanthis flammea flammea (Linné)

Fringilla flammea Linné, Syst. Nat., ed. 10, **1**, 1758, p. 182. (Sweden.)
English: Redpoll.
Japanese: Beni hiwa (rouge finch.)

Won (1934, 17) assigns the immature bird he took in Hamgyong Namdo to *A. hornemanni exilipes* on the basis of "published descriptions", and also so identifies one of the two specimens he took in Pyongan Namdo 20 February 1938 (in his holograph list). While Yamashina and the 1942 Hand-List both accept the records, the measurements of the specimens are well within the range of *flammea*, and I do not believe they should be considered as anything else until they have been com-

pared with specimen material. I examined the two specimens, both young males, in the LiWong Museum, and found them typical *flammea*.

Specimen records:

Hamgyong Pukto — 17 Nov. 1929 (im.) (Yam).
Hamgyong Namdo — 1 Jan. 1931 (im.) (Won).
Pyongan Namdo — 20, 20, 22 Feb. 1938 (Won).
Kyonggi Do — 24 Mar. 1910 (2) (LiWM); 1 Sept. 1927 (2) (Taka).

The Redpoll is an uncommon, irregular winter visitor in Korea.

332. Uragus sibiricus ussuriensis Buturlin

Uragus sibiricus ussuriensis Buturlin, Mess. Orn., 1915, p. 128. (Ussuri.)
English: Ussurian Long-tailed Rosy Finch.
Japanese: Beni mashiko (red monkey-child.)

Specimen records:

Hamgyong Pukto — 29 May, 2 June 1912 (USNM); 7 Nov. 1916 (Kur); 12. Aug., 27 Oct. 1929 (Yam).
Hamgyong Namdo — 25 July 1916 (SSC); Aug. (Kur); 1 Feb. 1931 (Won).
Pyongan Namdo — 14 Nov. 1932 (Won).
Kyonggi Do — Dec. 1887 (3) (Tacz); 27 Nov. 1916 (LiWM); 24 Apr. 1917 (Kur); 10 Dec. 1924 (2), 10 Dec. 1927, 8 Feb. 1928 (SoM).
Cholla Namdo — 2 Mar. 1930 (Yam).

This species is an uncommon summer resident in the northern highlands, wintering irregularly in southern Korea. Hashimoto (1937) experienced a marked flight of them at Hachibi Island in Kyonggi Do during the early spring of 1936; he saw 15 on 5 February, 10 on 18 March, and 8 on 21 April that year. Won (1934, 81) says that it is common and breeds at Nonsadon in Hamgyong Pukto. He collected a nest with four eggs at Anju, Pyongon Namdo, 1 May 1938, which is now in the Yamashima collection. There is a set of eggs in the LiWong Museum labelled "Beni Mashiko, Kyonggi Do, 27 May 1910."

333. Pyrrhula pyrrhula (Linné)

Pyrrhula coccinea var. *cassini* Baird, Trans. Chicago Acad. Sci., **1**, 1869, p. 316. (Nulato, Alaska.)
Pyrrhula cineracea Cabanis, Journ. für Orn., 1872, p. 316. (Lake Baikal.)
Pyrrhula rosacea Seebohm, Ibis, 1882, p. 371. (Yokohama.)

English: Bullfinch.
Japanese: Uso (autochthonous.)

The usual wintering Bullfinch in Korea is *P. p. rosacea*. I have examined the two specimens in the Yamashina collection on which the presence of the other two races in Korea is based, each collected by Orii in Hamgyong Pukto. The specimen of the northeastern race, *cassini*, is an adult male, and is larger and markedly redder than any of the series of *rosacea*. Also larger, but singularly blue-gray on comparison with other specimens is a female taken 12 November 1929, which is probably *cineracea*.

The relationship betwen the eastern Asiatic forms of *Pyrrhula pyrrhula* is still a moot question, and the application of their racial names has been variously interpreted. The name *cassini*, for instance, was at one time applied to the gray form which is now known as *cineracea*. This gray bird is frequently given specific rank, because of the absence of any intermediate specimens, and on the evidence of Sushkin (1925, 14), who found it breeding in the same area of south-central Siberia occupied by the pink-bellied subspecies *rosacea*, and evidently not interbreeding with it. If his observation is correct, this may be a case of a peripheral subspecies expanding its range into territory already occupied, and reacting specifically with the resident form from which, by morphological criteria, it is only subspecifically distinct. Yamashina has expressed to me his present opinion, which is that *cineracea* is a mutant of limited and narrow distribution, perhaps coexistant in the same territory with the parent stock from which it sprang, and with which it cannot interbreed because of cytological disharmony. While both hypotheses are logical and plausible, neither resolves the systematic problem involved by this almost unique case, for which there is neither provision in the International Code of Zoological Nomenclature, nor precedent in systematic usage. Because its relationship to the other forms is still imperfectly understood, I prefer to accord *cineracea* only subspecific rank, which, morphologically at least, is all it deserves.

Specimen records:

Pyrrhula pyrrhula cineracea:
Hamgyong Pukto — 12 Nov. 1929 (Yam).
Pyrrhula pyrrhula cassini:
Hamgyong Pukto — 6 Nov. 1929 (Yam).

Pyrrhula pyrrhula rosacea:

Hamgyong Pukto — 6 Nov. 1915 (SSC); 28 Oct.-9 Nov. 1929 (4) (Yam).
Kyonggi Do — Feb., Mar. 1887 (Tacz); Apr. 1910, 25 Dec. 1911 (LiWM); 13 Dec. 1926 (2) (Taka); 18 Jan. 1928 (SoM); 28 Jan. 1928 (Won).
Cholla Namdo — 24 Feb.-2 Mar. 1930 (5) (Yam).
Kyongsang Namdo — 18 Apr. 1886 (USNM).

The Bullfinch is an uncommon and irregular winter visitor to Korea. Taczanowski (1888, 466) says it is "rare in winter". Won (1934, 81) calls it rare. Kobayashi (1931) ventures a doubtful sight record for Kyonggi Do, 30 March 1931. Hashimoto (1937) saw five at Hachibi Island, Kyonggi Do, 30 September 1934. There are no other data.

334. Loxia curvirostra japonica Ridgway

Loxia curvirostra japonica Ridgway, Proc. Biol. Soc. Wash., **2**, 1885, p. 101. (Japan.)

English: Japanese Crossbill.
Japanese: Isuka (autochthonous.)

Yamashina (1932, 219) synonymizes *caucasica* Buturlin with *japonica*, and points out that the latter itself is a fine-drawn race, differing from *curvirostra* Linné only in the deeper, brighter coloring of the adult male.

Specimen records:

Pyongan Namdo — 30 Oct., 12 Dec. 1932 (Won).
Kyonggi Do — Feb. 1887 (7) (Tacz); Feb., 24 Mar. 1910 (7), 17 Dec. 1911 (2) (LiWM); 13 May 1912 (SSC); 21 Jan. 1918 (Kur); 20 Feb. 1927 (3) (Taka); 26 Oct. 1933 (Uch).
Cholla Namdo — 1 Apr. 1927, 26 Oct., 13 Nov. 1930 (Uch); 24 Feb. 1930 (4) (Yam).

The Crossbill is an uncommon and irregular winter visitor in Korea. Taczanowski (1888, 466) says "common in autumn and winter, absent in summer". Y. Kuroda and Miyakoda (1919) give its season in Seoul as from September through December, which does not coincide with the specimen record. Won (1934, 82) calls it a common winter visitor. Hashimoto (1931) saw Crossbills only on Shichihatsu Island in Cholla Namdo. In addition to the specimens he sent Uchida from there, he saw others 3 January 1931, and several from 26 October to 13 November 1930.

335. Erythrina rosea (Pallas)

Fringilla rosea Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 699. (Udam and Selengam.)

English: Pallas' Rose-finch.

Japanese: O-mashiko (large monkey-child.)

Specimen records:

Hamgyong Pukto — 11 May 1918 (Taka); 27 Oct. 1929 (3) (Yam).
Hamgyong Namdo — 15 Feb. 1928, 1 Feb. 1931 (Won).
Pyongan Pukto — 2 Jan. 1928 (SoM).
Pyongan Namdo — 21 Dec. 1932 (Won).
Hwanghae Do — 11 Jan. 1914 (2) (LiWM).
Kyonggi Do — Feb. 1887 (Tacz); 12-25 Jan. 1914 (7) (LiWM); 3 Feb. 1918 (2) (Taka); 2 Jan. 1928, 26 Dec. 1929 (SSC); 23 Feb. 1928, 9 Mar. 1929, 12 Feb. 1930 (Won); 18 Mar. 1936 (Uch).
Kyongsang Namdo — 5 Jan. 1924 (Uch).

This species is a not uncommon, but irregular winter visitor. Taczanowski (1888, 466) says it is "common in winter, not met in summer". Won (1934, 82) calls it common. Hashimoto (1937) saw a flock of ten on Hachibi Island in Kyonggi Do 23 September 1936. I did not encounter it.

336. Fringilla montifringilla Linné

Fringilla Montifringilla Linné, Syst. Nat., ed. 10, **1**, 1758, p. 179. (Sweden.)

English: Brambling.

Japanese: Atori (autochthonous.)

Specimen records:

Pyongan Pukto — 9 June 1917 (LiWM); 4-17 Apr. 1929 (10) (Yam).
Pyongan Namdo — 30 Apr. 1917 (Kur); 17 Oct. 1932 (Won).
Kyonggi Do — 23, 24 Oct. 1883 (USNM); Dec. 1887 (Camp); Feb., Mar. 1889 (4) (Camp); 28 Mar. 1910 (2), 27 Mar.-20 Apr. 1911 (6), 6 Jan., 15 Dec. 1912 (LiWM); 22 Apr. 1917 (Kur); 17 Jan. 1928 (2) (SoM); 21, 23 Feb. 1928, 29, 30 Sept. 1929 (Won); 8 Apr. 1933 (Uch); 20 Jan.-13 Apr. 1946 (8) (MCZ).
Chungchong Namdo — 17 Dec. 1917 (SSC); 20 Apr. 1923, 3 May 1926, 30 Apr. 1930, 12 Nov. 1931 (2) (Uch).
Cholla Namdo — 29 Jan. 1930 (Yam).
Kyongsang Namdo — 18 Dec. 1914 (LiWM).

The Brambling is a common migrant in spring and autumn throughout Korea, and a not uncommon winter visitor from Kyonggi Do southward. Taczanowski (1888, 466) says it is a "winter resident in the conifer forests, absent in summer; in winter it is very abundant and feeds mostly on pine seeds." Y. Kuroda and Miyakoda (1919) give its Seoul season as from November through April, which is roughly correct, though from the specimen record 20 October to 20 April is better. Hashimoto (1931) gives early arrival dates at Shichihatsu, Cholla Namdo, 26 September 1931 and 2 October 1930, and (1937) he saw a flock of 15 at Hachibi Island, Kyonggi Do, 17 September 1936.

I found it not uncommon at Suwon through the winter, though never in any numbers, usually one or two individuals at a time in the thin woods in company with Rustic and Yellow-throated Buntings. The Bramblings suddenly increased markedly in numbers during the third week in March, coincidental with a similar increase in Naumann's Thrushes. From March 20th, small flocks numbering up to twenty birds moved through the tree tops singing their thin little spring song, until April 12th, when the flight slackened. I saw the last one on April 18th.

337. Leucosticte arctoa brunneonucha (Brandt)

Fringilla (*Linaria*) *brunneonucha* Brandt, Bull. Sci. Acad. Imp. Sci. Pétersb., **10**, 1842, p. 252. (Kurile Islands.)

English: Japanese Ground Linnet.

Japanese: Hagi mashiko (Lespedeza, or bush-clover monkey-child.)

Specimen records:

Hamgyong Pukto — 15 Nov. 1929 (4) (Yam).

While it is possible that this northern breeder winters more or less regularly to the high plateau country in northern Korea, the record does not justify its being considered at present as more than a straggler. Yamashina (1929, 258) reports the two pairs Orii collected at Bampo, Hamgyong Namdo, as above. It is the only record for Korea.

338. Emberiza leucocephalos leucocephalos S. G. Gmelin

Emberiza leucocephalos S. G. Gmelin, Novi Comm. Acad. Sci. Imp. Petrop., **15**, 1771, p. 480, pl. 23, fig. 3. (Astrachan.)

English: Pine Bunting.

Japanese: Shiraga hojiro (white-headed white-cheek.)

Specimen records:

Hwanghae Do — 21 Mar. 1914 (2) (LiWM).
Korea — 25 Feb. 1911 (Kur), undated (Sci. College coll., Tokyo).

The Pine Bunting is little more than a straggler in Korea, known only by the three records listed above.

339. Emberiza rutila Pallas

Emberiza rutila Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 698. (Mongolia.)

English: Chestnut Bunting.
Japanese: Shima nojiko (island field-path-child.)

Specimen records:

Hamgyong Pukto — 23 Aug.-14 Sept. 1914 (6) (LiWM); 16 May 1918 (2) (Taka).
Pyongan Pukto — 10 May-4 June (9) (Yam).
Kangwon Do — 3 Oct. 1914 (LiWM).
Kyonggi Do — 11 May 1887 (2) (Tacz); May 1889 (3) (Camp); 13 May 1909 (2) (LiWM); 20 May 1913, 10 May 1925 (SSC); 21 Mar. 1928 (4) (Taka); 15 Feb. 1929 (2) (SoM); 16 May, 18 Oct. 1930, 20 Apr. 1931 (Won); 9 May 1934 (Uch).
Cholla Namdo — 20 May 1930 (2), 7 May 1932 (Uch).

The Chestnut Bunting is a not uncommon spring and autumn transient, evidently more common in the northern provinces nearer the mainland flight-route than it is farther south on the peninsula. Taczanowski (1888, 456) says "one never sees it in summer or in winter". Y. Kuroda and Miyakoda (1919) list it for the Seoul region in October only. Hashimoto (1931) notes its arrival at Shichihatsu Island in Cholla Namdo 1 May 1930 and 8 May 1931, and (1937) observed it at Hachibi Island in Kyonggi Do 21 May, 30 August and 5 September 1934 (20), 2 November 1935, and 25 November 1936, (10). Won (1934, 82) calls it a spring and autumn transient. He also adds that it breeds at Musan in Hamgyong Pukto, which is extremely unlikely, and in which no other authorities have concurred.

340. Emberiza aureola ornata Shulpin

Emberiza aureola ornata Shulpin, Ann. Mus. Zool. Acad. Sci. URSS., **28** (3), 1927 (1928), p. 401. (Southern Ussuriland.)

English: Yellow-breasted Bunting.
Japanese: Shima aoji (island greenfinch.)

Specimen records:

Hamgyong Pukto — 15-24 May 1912 (5) (AMNH); 4, 17, 25 Sept. 1917 (LiWM); 2 Aug. 1929 (MCZ).
Pyongan Pukto — 31 May, 8 June (3) 1914 (LiWM); 30 Apr.-31 May 1929 (11) (Yam).
Pyongan Namdo — 13-20 May 1917 (5) (LiWM); 20 May 1917 (SSC); 25 May 1933 (Won).
Kangwon Do — 6 Sept.-9 Oct. 1914 (4) (LiWM).
Kyonggi Do — 27 May 1927 (Won); 23, 26 Sept., 4, 5, 9 Oct. 1927 (Taka); 8 May 1929 (SoM); 30 May 1933 (Uch).
Cholla Namdo — 11, 13 May 1926, 20 May (2), 28 Oct. 1930 (Uch).

The Yellow-breasted Bunting is another of the continental migrants, a common spring and autumn transient in the northern provinces of Korea, but less plentiful below the 38th parallel. It evidently breeds in the northern mountains. Its nest and eggs have been collected in nearby Manchuria, but the only evidence of its nesting in Korea is the August specimen from Hamgyong Pukto in the M.C.Z. This bird, collected by Won, is a juvenal just starting to moult into immature plumage, and could not have moved far from where it was hatched.

341. Emberiza elegans elegans Temminck

Emberiza elegans Temminck, Pl. Col., livr. 98, 1835, pl. 583, fig. 1. (Japan.)

English: Yellow-throated Bunting.
Japanese: Miyama hojiro (mountain white-cheek.)

Specimen records:

Hamgyong Pukto — 28 June, 18 Oct. 1917 (Uch); 27 July-21 Aug. (1 ad., 3 Juv.), 15-21 Oct. (8) 1929 (Yam); 27 Aug. 1929 (MCZ).
Pyongan Pukto — 8 June 1917 (LiWM); 3-13 Apr. 1929 (8) (Yam).
Kangwon Do — 30 June 1929 (Yam).
Kyonggi Do — 24 Oct. 1883, 20 Sept. 1929, 4 Apr. 1930 (USNM); Dec., Jan., Mar. 1887 (Tacz); Jan., Feb. 1889 (3) (Camp); 25 Oct.-Feb. 1909-14 (8), 27 June 1915 (2) (LiWM); 1 June 1912 (SSC); 22 Apr. 1917 (4) (Kur); 5 Oct. 1927 (Taka); 8 Oct. 1928, 30 Mar. 1929 (SoM); 27 Oct.-25 Mar. (7), 7 June 1929 (Won); 15 Mar., 8 Apr., 28 Sept. 1933, 21, 28 Apr., 2 May 1934, 26 Mar. 1936 (Uch); 29 Nov. 1945-6 Apr. 1946 (16) (MCZ).
Cholla Namdo — 19 Jan. 1930 (Yam); 30 Oct. 1930 (Uch).
Kyongsang Namdo — 30 Nov. 1883, 19 Apr., 14 Dec. 1884, 26 Apr. 1886 (USNM).

The Yellow-throated Bunting is a not uncommon summer resident in northern Korea, breeding in the highlands possibly as far south as Kangwon Do. It is a common winter visitor from Kyonggi Do southward.

Y. Kuroda and Miyakoda (1919) delineate its season to Seoul as October and November, and from February to early May but the former (1935, 88) observed it still lingering in Chungchong Pukto 25 May 1931. I found it common in the Seoul-Suwon area from my arrival in late November continuously until late March, small flocks of a dozen or so birds foraging through what little underbrush they can find. The flocks seem predominantly males, and I had to make a special effort to find and collect the four retiring and duller colored females in my series of sixteen birds. The wintering flocks departed from Suwon during the last week in March, but stragglers were observed until mid-April.

342. Emberiza spodocephala Pallas

Emberiza spodocephala Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 698. (Daurian region.)

Emberiza spodocephala extremi-orientalis Shulpin, Orn. Monatsb., **36** (3), 1928, p. 82. (Amurland and Korea.) (Nom. emend.)

English: Black-faced Bunting.

Japanese: Kara aoji (Chinese greenfinch.)

The breeding form of this species in Korea is *E. s. extremi-orientalis*, characterized by deep yellow on throat and breast. Typical *E. s. spodocephala*, the paler, less yellow form which breeds farther northward and westward, occurs in Korea only as a winter visitor. Some of the wintering birds, and many of the migrants are intermediate in coloring between the two. Yamashina (1932, 221) found Orii's excellent series of 29 spring, summer and autumn birds from the northern provinces "all show the special features of *E. s. extremi-orientalis*". So also do the 21 specimens from the border provinces in the American Museum of Natural History, and the single August Hamgyong Pukto bird in the Museum of Comparative Zoölogy. Two of my January males from Kyonggi Do are unquestionably *spodocephala*, for the yellow in their anterior underparts is very pale and light, in fact hardly discernible. My four mid-April specimens, however, are much nearer to, if not typical of *extremi-orientalis*. The 15 birds in the Rothschild collection, taken on migration in early May in Hamgyong Namdo, show some intergrade characteristics, but the yellow of the southern

form predominates. Because of the impossibility of identifying all the migrant and wintering specimens subspecifically, the specimen record is not subdivided.

Specimen records:

Hamgyong Pukto — 26 Apr.-31 May 1912 (15) (AMNH); 16-28 Sept. 1917 (7) (LiWM); 2 Aug. (juv), 19 Sept.-18 Oct. (9) 1929 (Yam); 7 Aug. 1929 (MCZ).
Hamgyong Namdo — 2-15 May 1903 (13) (Roth).
Pyongan Pukto — 12 June 1912 (6) (AMNH); 13 Apr.-6 May 1929 (19) (Yam).
Pyongan Namdo — 18 May 1917 (LiWM); 11 Apr., 4 May 1931, 11 May 1933 (Won).
Kangwon Do — 8 Oct. 1914 (6) (LiWM).
Kyonggi Do — May 1887 (Tacz); Oct. 1889 (Camp); 23-27 Apr. 1911 (5), 17 Oct. 1914 (4) (LiWM); 5 Oct., 15 May 1912 (SSC); 22 Apr. 1917 (Kur); May 1926 (SoM); 4-8 Oct. 1927 (14) (Taka); 30 Apr. 1928, 10 Oct. 1929, 11 May 1932 (Won); 21, 27 Apr. 1934 (Uch); 6 Jan.-26 Feb. (6), 6-16 Apr. (4) 1946 (MCZ).
Cholla Namdo — 28 Oct., 6 Nov. 1930 (Uch).

The Black-faced Bunting is a common bird in Korea. It breeds in the northern highlands, is frequently abundant in migration, especially in the border provinces, and winters in small numbers from Kyonggi Do southward. Cumming (1933, 20) writes "they are usually seen in small groups of from two to five feeding in the hedges or along the roads or hillsides where there is thick cover nearby. They are shy and take flight easily, but do not go far." This nicely sums up my own experience with them, except that both the birds and myself had trouble finding any "thick cover" in Kyonggi Do in 1945-46.

343. Emberiza sulphurata Temminck and Schlegel

Emberiza sulphurata Temminck and Schlegel, in Siebold's Fauna Japonica, Aves, 1848, p. 100, pl. 60. (Japan.)

English: Japanese Yellow Bunting.
Japanese: Nojiko (autochthonous, but characters mean field-path-child).

Specimen records:

Kyonggi Do — 10 Oct. 1927, 1 Oct. 1928 (SoM).

This species is a straggler from the Japanese main islands. Kuroda (1917, 79) considered it of doubtful occurrence on the peninsula, and included it only on "the basis of other authors", which then consisted of its being mentioned in the three early nominal lists (Iizuka *et al* 1914, Taka-Tsukasa and Kuroda 1915, and Mori 1916), without substantiation. Both Yamashina (1933, 183) and the 1942 Hand-List give the bird as occurring in Korea, but without details or comment. The only specimens known from Korea are the two listed above, in the Songdo Museum, the first of which was collected by Won (1934, 83).

344. Emberiza cioides Brandt

Emberiza cioides castaneiceps Moore, Proc. Zool. Soc. London, 1855, p. 215. (Kintang, China.)

Emberiza cioides weigoldi Jacobi, Abh. Ber. Mus. Dresden, **16** (1), 1923, p. 36. (Chihli, N. E. China, 30 km. north of Balihandien.)

Emberiza cioides tyoosenica Momiyama, Journ. Chosen Nat. Hist. Soc., (4), 1927, pp. 3, 4. (Koryo, Kyonggi Do, Korea.) (Synonym of *castaneiceps*.)

English: Meadow Bunting.

Japanese: Hojiro (white-cheek.)

The 1942 Hand-List follows Yamashina's (1932, 221) diagnosis of the races of Meadow Bunting in Korea. He states "*E. c. weigoldi* breed in the most northern part of Korea, and in winter migrate southward to the middle part (neighborhood of Seoul). Those which breed in the neighborhood of Chosen [northern Kangwon Do] belong to *E. c. castaneiceps*." He had 22 spring, summer and autumn adults from Hamgyong Pukto and Pyongan Pukto which he calls *weigoldi*, and three summer Kangwon Do adults and one Cholla Namdo winter bird which he assigns to *castaneiceps*. While my series unfortunately throws no further light on the dividing line between the breeding grounds of the two races in Korea, nor between their respective wintering grounds, it bears out the correctness of Yamashina's interpretation. My eight wintering males, taken from 25 November to 9 February are all the larger, lighter, northern form. These birds were common at Suwon throughout the winter, but started to dwindle in numbers early in March, and after mid-March no Meadow Buntings were seen until early April. My series of spring males, taken from 7 April to 1 May are all the smaller, darker, brighter *castaneiceps*, as are two males from Wonsan, Hamgyong Namdo, in the Rothschild collection taken 24, 27 April. Two other Rothschild males, taken 21, 26 April in the same locality are *weigoldi*, as are the three birds Andrews collected in June on

the border. The two races are well marked and distinct, individually as well as in series, and the absence of any intermediates or intergrades is notable. Size, however, is not as good a criterion as the color difference between the adult males, echoed to a lesser extent by the females. As for Momiyama's *tyoosenica*, I find no difference whatever between my winter Kyonggi Do series of *weigoldi* and an excellent series of them in the M.C.Z. from north China and Manchuria, nor between my spring *castaneiceps* and a large series of topotypical material from central China of comparable dates and plumages.

Specimen records:

Emberiza cioides weigoldi:

Hamgyong Pukto — 29 Aug.-25 Sept. 1917 (6) (LiWM); 15 Sept.-19 Nov. 1929 (8) (Yam); 27 July 1929 (MCZ).
Hamgyong Namdo — 21, 26 Apr. 1903 (Roth).
Pyongan Pukto — 3 June 1912 (3) (AMNH); 3-12 June 1917 (3) (LiWM); 7-10 Apr. 1929 (3) (Yam), 26 Dec. 1929 (Won).
Kyogngi Do — Jan. 1889 (Camp); Nov. 1909, 24 Dec. 1911 (LiWM); 26 Feb. 1926 (Kur); 6 Dec. 1929, 25 Jan. 1932 (Won); 25 Nov. 1945-12 Feb. 1946 (13) (MCZ).

Emberiza cioides castaneiceps:

Hamgyong Namdo — 24, 27 Apr. 1903 (Roth.)
Pyongan Namdo — 30 Apr. 1917 (2) (Kur); 14 May 1917 (2) (LiWM).
Kangwon Do — 8 Sept., 4 Oct. 1914 (LiWM); 14, 15 June 1929 (3) (Yam).
Kyonggi Do — 12 Aug. 1883 (2) (USNM); Apr., July, Sept. 1889 (Camp); 30 Apr. 1911, 5 July 1915 (LiWM); 2 Apr. 1916 (SSC); 19, 22 Apr., 12 Nov. 1917 (Kur); 6 July, 8 Oct. 1929, 15 July 1932 (Won); 20 Mar. 1934 (Uch); 7 Apr.-1 May 1946 (9) (MCZ).
Chungchong Namdo — 8 Apr. 1917 (3) (Kur).
Cholla Namdo — 17 Apr. 1917 (Kur); 6 Jan. 1930 (Yam).
Kyongsang Pukto — 17 Oct. 1923 (Uch).
Kyongsang Namdo — 3, 5 Aug. 1880 (G & S); 3 May 1883, 30 Jan., 20 Apr. 1884 (USNM); 6 Apr. 1917 (2) (Kur).

The Meadow Bunting is a common resident. Through the winter it tends to remain in smaller flocks than either the Rustic or Yellow-throated Buntings, and is usually found in more open country. *E. c. weigoldi* is one of the earliest wintering Emberizas to depart. When *castancieeps* arrives in April, the birds are usually observed in pairs, evidently having mated either on the wintering grounds, or in transit therefrom. Orii collected a nest with four eggs 27 June 1928, in Kang-

won Do, which are now in the Yamashima museum. Adachi (1941, 65) found its nest in Hamgyong Pukto.

345. Emberiza jankowskii Taczanowski

Emberiza jankowskii Taczanowski, Ibis, 1888, p. 317, pl. 8. (Sidemi, near Vladivostok.)

English: Jankowski's Bunting.

Japanese: Koma hojiro (north Korean white-cheek.)

Specimen records:

Hamgyong Pukto — 15-25 Oct. 1929 (6) (Yam).

This extremely localized species is resident in southern Ussuria, southeastern Manchuria, and the adjoining portion of northeastern Korea. Yamashina (1933, 193) says of it "limited in Korea to the region in the immediate vicinity of the river on the northeast boundary, where it is not uncommon." Unlike a similar homologous Nearctic relict species, the Ipswich Sparrow, which is limited in its breeding range to Sable Island, Nova Scotia, and migrates southward along the Atlantic seaboard, Jankowski's Bunting does not migrate, for it has never been taken outside its narrow breeding range.

346. Emberiza fucata fucata Pallas

Emberiza fucata Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 698. ("Ad Ononem et Ingodam in ripis.")

English: Grey-headed Bunting.

Japanese: Hoaka (red-cheek.)

Specimen records:

Hamgyong Pukto — 17, 29 Aug. 1917 (3) (LiWM); 18 Apr. 1918 (Taka); 28, 29, 30 July 1929 (Won).

Pyongan Pukto — 12 June 1912 (4) (AMNH); 9 June 1917 (3) (LiWM); 17 Apr.-6 May 1929 (8) (Yam).

Pyongan Namdo — 14 May 1917 (LiWM); 11 May 1932 (SSC); 28 Apr.-26 Oct. 1932 (6) (Won).

Kangwon Do — 6-24 Sept. 1914 (3) (LiWM); 13 June 1929 (Yam).

Kyonggi Do — 12 Aug. 1883 (USNM); May 1887 (Tacz); July 1889 (4) (Camp); 27 Apr. 1911, 8 June 1913, 25 Jan., 17 Oct. 1914, 5 July, 14 Aug. 1915 (LiWM); 2 May 1926 (SoM); 28 Nov. 1933 (Uch); 12 Dec. 1945, 15 Apr.-1 May 1946 (4) (MCZ).

Cholla Namdo — 23 Feb. 1930 (Yam); 24, 29 Apr., 10 May, 12 Nov. 1931 (Uch).

Kyongsang Namdo — 2, 4 Aug. 1880 (G & S).

This species is a common summer resident throughout Korea. A few stragglers remain in winter in the southern provinces. Taczanowski (1888, 465) says "common in spring, nests in small numbers, gone in winter". Won (1934, 83) calls it common and breeding. The species had departed when I arrived in late November, but I shot a straggling female from a flock of Yellow-throated Buntings 12 December, and saw no more until the first spring migrants appeared the following April 15th. While it must breed in Korea, there are no data on its nesting.

347. Emberiza rustica rustica Pallas

Emberiza rustica Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 698. ("In salicetis Davuriae".)

English: Rustic Bunting.

Japanese: Kashiradaka (autochthonous, but means high-headed.)

Specimen records:

Hamgyong Pukto	— 17 Dec. 1915 (SSC); 2-27 Oct. 1929 (7) (Yam).
Pyongan Namdo	— 25 Jan.-20 Apr. 1932 (5) (Won).
Kangwon Do	— 25, 26 Nov. 1929 (3) (Yam).
Kyonggi Do	— 27 Oct. 1887 (2) (Tacz); Dec., Jan., Apr. 1889 (5) (Camp); Feb. 1910 (2), 5, 30 Apr. (3), 17 Dec. 1911, 15 Dec. 1912, 25 Nov. 1913, 25 Oct. 1914 (LiWM); 25 Nov. 1926 (4), 2 Jan. 1927 (4) (Taka); Apr. 1929 (SoM); 2 Apr. 1917 (Uch); 12 Nov. 1917, 26 Feb. 1926 (Kur); 6, 15 Feb., 2, 5 Sept. 1929, 4 Apr. 1930 (Won); 6 Feb. 1930 (USNM); 4 Dec. 1945-24 Apr. 1946 (41) (MCZ).
Chungchong Namdo	— 8 Apr. 1917 (Kur).
Cholla Namdo	— 2 Jan. 1930 (Yam); 22 May 1928, 26 Feb., 30 Oct., 12 Nov. 1930 (Uch).
Kyongsang Namdo	— 18 Dec. 1914 (LiWM).

The Rustic Bunting is a common spring and autumn transient in the northern provinces, and an abundant winter visitor from Kyonggi Do southward. I found it by far the commonest of the wintering small birds in the Suwon area. When you encountered Fringillids at all, you found Rustic Buntings. From December through March flocks numbering upwards of 500 birds lived among the weeds in the mulberry fields, and smaller bunches could be found wherever there was cover at almost any time. They began to depart in mid-March, and by early April had all disappeared except for the usual few stragglers.

348. Emberiza pusilla Pallas

Emberiza pusilla Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 697. (Daurian region.)

English: Little Bunting.
Japanese: Ko-hoaka (small red-cheek.)

Specimen records:

Pyongan Pukto — 28 Apr.-6 May 1929 (7) (Yam).
Kyonggi Do — Dec. 1916 (LiWM).
Cholla Namdo — 7 Oct. 1931, 5 May 1932 (Uch).
Korea — Oct. 1917 (2) (Taka).

This species is evidently a not uncommon spring transient along the northern border. It is another of the continental migrants which follow the mainland coastline, and occur farther southward on the Korean peninsula only casually. Its occurrence in Korea was based on the three specimens in the LiWong and Taka-Tsukasa collections until Orii encountered it during the spring flight in Pyongan Pukto.

349. Emberiza chrysophrys Pallas

Emberiza chrysophrys Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776, p. 698. (Daurian region.)

English: Yellow-browed Bunting.
Japanese: Kimayu hojiro (yellow-eyebrowed white-cheek.)

Specimen records:

Hamgyong Pukto — 10 May 1918 (SSC).
Pyongan Pukto — 2 May 1929 (2) (Yam).
Pyongan Namdo — 14 May 1917 (LiWM).

The Yellow-browed Bunting is a rare spring transient along the northern border. It has never been taken in the southern two-thirds of the peninsula.

350. Emberiza variabilis Temminck

Emberiza variabilis Temminck, Pl. col., livr. 98, 1835, pl. 583, fig. 2. (Northern Japan.)

English: Japanese Grey Bunting.
Japanese: Kuroji (black finch.)

Specimen records:

Kyonggi Do — 10 Dec. 1927 (SoM).

This species is a straggler from the Japanese main islands. The single record appears in Snyder's list (1937) of the specimens in the Songdo Museum. Won should have known of it, but he makes no mention of it, nor does the 1942 Hand-List.

351. Emberiza tristrami Swinhoe

Emberiza tristrami Swinhoe, Proc. Zool. Soc. London, 1870, p. 441. (Amoy, China.)

English: Tristram's Bunting.
Japanese: Shirohara hojiro (white-bellied white-cheek.)

Specimen records:

Hamgyong Pukto — 29 May 1912 (AMNH); 1 Oct. 1912 (SSC); 28 Sept. 1917 (LiWM).
Pyongan Pukto — 31 May 1917 (2) (LiWM); 20 Apr. 1918, 31 May 1917 (Taka); 24 Apr.-6 May 1929 (12) (Yam).
Kangwon Do — 13 Sept. 1914 (LiWM).
Kyonggi Do — 4-14 Oct. 1883 (4) (USNM); May 1889 (Camp); 30 Apr. 1917 (Kur); 4 Nov. 1933, 28 Apr., 9 May 1934 (Uch); 21 Apr. 1946 (2) (MCZ).
Cholla Namdo — 27 Apr., 20 May 1930 (Uch).
Kyongsang Namdo — 27 Apr. 1885 (USNM).

Tristram's Bunting is a common spring and autumn transient in the two northern provinces, and an uncommon one elsewhere in Korea. Campbell (1892, 241) says "This Bunting appeared to be very rare". Yamashina (1933, 211) considers it "especially common in spring and autumn in Pyongan Pukto". I encountered one small flock of five birds in the heavy forest south of Suwon in late April, of which I collected two.

352. Emberiza yessoensis continentalis Witherby

Emberiza yessoensis continentalis Witherby, Bull. Brit. Orn. Cl., **31**, 1913, p. 74. (Nanking, China.)

English: Chinese Reed Bunting.
Japanese: Chosen ko-jurin (Korean little reed bunting.)

Specimen records:

Hamgyong Pukto — 15-26 Oct. 1929 (2 ad., 1 im.) (Yam).
Hwanghae Do — 20 Apr. 1917 (SSC).
Kyonggi Do — 25 Nov. 1913, 5 Jan., 1 Feb., 23 Nov. 1914, 31 Jan. 1915 (LiWM); Jan. 1918 (3) (Taka); 21 Jan. 1929 (SoM); 9 Jan. 1930 (SSC); 26 Oct. 1930 (Kur); 18 May 1936 (Uch).
Cholla Namdo — 27 Dec. 1929 (3) (Yam).

This species is evidently an uncommon transient in the northern provinces, and an equally uncommon winter visitor in the southern half of Korea. There is nothing in the literature about it except the specimen records above, and I never encountered it. As it breeds in Amuria and Ussuria and winters to central China, it should be more abundant, at least in the northern provinces on migration, than the specimen record indicates.

353. Emberiza pallasi minor Middendorff

Emberiza schoeniclus var. *minor* Middendorff, Sibir. Reise, **2**, p. 144. (Stanovoi Mountains to Udskoi-Ostrug.)

English: Lesser Reed Bunting.
Japanese: Shiberiya jurin (Siberian reed bunting.)

Specimen records:

Hamgyong Namdo — 8 Nov. 1919 (SSC).
Pyongan Namdo — 10 Feb. 1936 (Won).
Hwanghae Do — 20 Mar. 1914 (LiWM).
Kangwon Do — 26 Nov.-1 Dec. 1929 (7 ad., 3 im.) (Yam).
Kyonggi Do — Mar. 1887 (4) (Tacz); 29 Dec. 1913, 8, 15 Feb. 1914, 31 Jan., 10 Mar. 1915 (LiWM); Jan. 1918 (3) (Taka); 21 Jan., 3 Feb. 1918 (Uch); 24 Apr. 1917, 26 Oct. 1920, 13 Mar., 5 Nov. 1929 (Kur); 15 Feb. 1927 (SSC); 15 Dec. 1927, 4 Nov. 1929 (SoM); 27 Feb. 1928, 20 Jan. 1931, 3, 5, 9 Dec. 1929 (Won); 12 Dec. 1945-9 Mar. 1946 (12) (MCZ).
Cholla Namdo — 24 Dec. 1929-6 Jan. 1930 (6) (Yam).

The Lesser Reed Bunting is a not uncommon winter visitor from Kangwon Do and Kyonggi Do southward. It is a bird of the grassy roadside thickets and the reed beds along the shore. I found small numbers in the heavy weeds and brush along the irrigation ditches

fairly commonly and regularly during December and January. But by mid-January the Koreans had cut down to use as fuel every bit of the sort of cover this species requires inland, and the birds became hard to find, except in isolated small bunches near the shore where a few reeds remained.

354. Emberiza schoeniclus pyrrhulinus Swinhoe

Emberiza pyrrhulinus Swinhoe, Ibis, 1876, p. 333, pl. 8, fig. 2. (Hakodate, Hokkaido, Japan.)

English: Swinhoe's Reed Bunting.
Japanese: O-jurin (large reed bunting.)

Specimen records:

Kangwon Do — 30 Mar. 1914 (LiWM).
Kyonggi Do — 15 Nov. 1913, 3 Apr. 1914 (LiWM); 17 Oct. 1919 (Kur); 3 Feb. 1918 (5) (Taka).

This species is little more than a straggler from the Japanese main islands. Yamashina (1933, 222) calls it a winter visitor in Korea, but the specimen record does not indicate that it is of regular occurrence.

355. Calcarius lapponicus lapponicus (Linné)

Fringilla lapponica Linné, Syst. Nat., ed. 10, **1**, 1758, p. 180. (Lapland.)

English: Lapland Longspur.
Japanese: Tsumenaga hojiro (long toe-nailed white-cheek.)

Specimen records:

Hamgyong Pukto — 31 Nov. 1917 (Uch); 11 May, 6, 10 Nov. 1918 (Taka).
Pyogan Pukto — 4 Apr. 1929 (Yam).
Kyonggi Do — 31 Jan. 1915 (LiWM); 2 Mar. 1918 (2) (Taka); Feb., 31 May 1932 (Kur).
Cholla Namdo — 13 Dec. 1929-6 Jan. 1930 (10) (Yam).

The Lapland Longspur is an uncommon, sporadic transient and winter visitor in Korea. There is no reason why this circumpolar species should vary the irregularity of its habits between the Nearctic and the Palearctic. Korea probably gets a visitation of Longspurs sporadically every few winters, much as temperate North America does.

[*Plectrophenax nivalis nivalis* (Linné)

English: Snow Bunting.

Japanese: Yuki hojiro (snow white-cheek.)

The 1942 Hand-List says this species occurs in Korea. Yamashina (1933, 231) says it is "rare in Korea". Won (1934, 84) lists it as a rare winter migrant. However, I can find no record of a Korean specimen, and the only other mention of the Snow Bunting in the literature is Taczanowski's (1888, 459) statement that Kalinowski "encountered it in February [1888] near Wonsan [Hamgyong Namdo]." While as experienced a field man as Kalinowski could hardly be mistaken in identifying a Snow Bunting at sight, still, there is no specimen on record.]

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Yacho, **8** (2), Feb. 1941, pp. 62–68.
(Detailed notes on the nesting of five species, and breeding records for about fifteen more. The author was a primary school teacher in Hamgyong Pukto. Some of his identifications are questionable, and some of his statements are perhaps based on hearsay, not observation.)

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Published by the Club, Tokyo. Contains occasional ornithological papers, but only a few minor references to Korean birds in a complete file running from Vol. 1 through 5, dated 1929 through 1933.

ANDERSON, MALCOLM PLAYFAIR

1907. A collecting trip in Korea.
Condor, **9**, 1907, p. 146–147.
(A brief account of a trip made to a region sixty or seventy miles northeast of Seoul between 29 October and the end of November, 1906. Mentions, by generic names only, a few species seen and collected.)

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Condor, **21**, May, 1919, pp. 115–119, por.

ANDREWS, ROY CHAPMAN

1944. "Under a Lucky Star."
New York, 12 mo, 1944. pp. 1–300.
(An interesting short popular account of his trip to Korea in 1912 is given on pages 102–114.)

Annotationes Ornithologiae Orientalis. (In Japanese and English.)
Published in Tokyo by Anthenaei Ornithologici Momiyamici;
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(The above is all of Momiyama's private journal ever published.)

ANON.

1909. "[Bird Notes from Korea.]" (In Japanese.)
Zool. Mag., **21** (248), 15 June 1909, p. 272.
(This is a letter, without heading, address or signature, containing the first Japanese bird notes from Korea. It mentions a flock of a thousand swans, also white-fronted and bean geese in Kangwon Do; many ruddy sheldrakes for sale in the Seoul markets;

falconing common in the Pyongan districts; rollers common near Seoul; cuckoos and other small birds heard. No dates or definite localities, and specific identifications sometimes doubtful.)

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1918–1922. "A Monograph of the Pheasants."
New York, 4to, vols. 1–4.
(Vol. 3, pp. 116–118, contains R. C. Andrew's notes on his field experiences with *Phasianus colchicus* in Korea.)

Bergman, Sten

1935. "Några Korta brev från Korea."
Fauna och Flora, 1935, pp. 170–172.

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Fauna och Flora, 1935, pp. 203–209.
(Neither of these two 1935 papers has been available to me.)

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12mo, John Gifford Ltd., London, 1938, pp. 1–232, map and num. photos.
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1897. "A Monograph of the Cranes." with illustrations by H. Leutman and J. G. Keulemans. pp. i–viii + 62, 22 col. pl., folio. Leiden and London.
(Not seen; only 170 copies of this work were ever published.)

Bolau, Heinrich

1891. "*Haliaetus pelagicus* und *H. branickii*."
Der Zoologische Garten, **32**, 1891, pp. 265–274.

1892. "On Specimens of *Haliaetus pelagicus* and *H. branickii* now living in the Zoological Gardens of Hamburg."
Proc. Zool. Soc. London, 1892, p. 173–174.
(A specimen of *branickii* (*niger*) received from Korea in 1887 never developed the white thighs and shoulder-patches of *pelagicus*.)

1894. "Der Riesen-Seeadler und der Korea-Seeadler im Zoologischen Garten in Hamburg."
Der Zoologische Garten, **35**, 1894, p. 193–194.

Botany and Zoology (In Japanese.)
Published monthly in annual volumes in Tokyo under the auspices of the Faculty of Science, Tokyo Imperial University. Contains occasional papers on Korea. Complete file runs from Vol. I, 1932 to Vol. XI, 1943.

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Published in Tokyo by the Biogeographical Society, an organization closely associated with the Ornithological Society.
(All Korean ornithological references have been taken from a complete file, running from Vol. 1, No. 1, Apr. 1929 to Vol. 14, No. 2, Jan. 1944.)

Buturlin, S. A.
1904. "On the Geographical Distribution of the True Pheasants, (Genus *Phasianus* sensu stricto)."
Ibis, 1904, pp. 377–414.
(Contains the original description of *Phasianus karpowi*.)
1910. "*Ninox scutulata ussuriensis*, n. subsp."
Mess. Orn., **1**, 1910, p. 187.

Campbell, C. W.
1892. "A List of Birds Collected in Corea."
Ibis, 1892, pp. 230–248.
(Lists the 112 species collected by the author while he was British Consul at Seoul and Inchon in 1888 and 1889. Gives first Korean records for 14 species, notes and comments on status and abundance, and describes as new *Suthora fulvicauda*, *Suthora longicauda*, and *Cettia minuta borealis*.)

Clark, Austin H.
1907. "Eighteen New Species and One New Genus of Birds from Eastern Asia and the Aleutian Islands."
Proc. U. S. Nat. Mus., **32**, 1907, pp. 467–475.
(Describes nine new forms in the Jouy collection.)
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1912. "Les Oiseaux du Musée de Zi-Ka-Wei."
Memoires concernant l'Histoire naturelle de l'Empire Chinois, par des Pères de la Compagnie de Jesus, tome V, 3^{e} cahier, 1912, p. 6.

(A specimen of *Haliaeetus niger*, taken from a nest in Korea in 1884, died in its cage at Zikawei, Shanghai, in Feb. 1908.)

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Trans. Korean Royal Asiatic Soc., **22**, pp. 1–94.
(The original "Notes" were read before the society in Seoul 28 January 1931, and published later with the addition of two sections, the first containing descriptions and a few notes on about 100 of the more common species, and the second a list of the species attributed to Korea by the 1932 Hand-List of Japanese Birds. Also included is a list of Korean bird names, in Korean characters without Romaji spelling or English translation. The work of an amateur, while it contains a few inaccuracies, its original contributions are of real value, particularly the author's personal observations. The Society reprinted it in 1945, and it is still obtainable at the Society's headquarters in Seoul.)

DELACOUR, JEAN

1928. "Mr. J. Delacour exhibited on behalf of Dr. Kuroda two very beautiful paintings . . . of . . . *Pseudotadorna cristata*."
Bull. B. O. C., **48**, 1928, p. 125.

DELACOUR, JEAN, and HACHISUKA, MASAUJI

1928. "Birds in Korea and North China." (In Japanese.)
Tori, **5** (25), March, 1928, pp. 500–506, 1 text fig.
(The secretary's summary of a lecture delivered before the Ornithological Society in Tokyo, 7 November 1927, on a recent five-week trip made by the authors to Korea and north China. Contains the first published record of *Mergus squamatus* from Korea, with Shimokoriyama's photo of the mounted bird in the LiWong Museum, and expresses opinions on the LiWong specimens of *Haliaeetus niger* and *Grus nigricollis*.)

Dobutsu-gaku Zasshi — see *Zoological Magazine*.

DOI, KANCHO

1920. "Report on the Birds of Heijo." (In Japanese.)
Tori, **2** (9), 1920, p. 253.
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GEN, KONKIU (see WON, HONG KOO)

GIGLIOLI, H. H., and SALVADORI, T. (also see SALVADORI and GIGLIOLI)
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HACHISUKA, MASAUJI (see also DELACOUR and HACHISUKA)
1925. "An example of *Pseudotadorna cristata* Kuroda."
Bull. B. O. C., **45**, pp. 46–48.
(Notes on the Copenhagen specimen by Hachisuka and Taka-Tsukasa, with succinct and pertinent comments by Ernst Hartert)
1930. "A Unique Specimen of *Mergus squamatus* from Korea." (In Japanese.)
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(A letter from Tamezo Mori to the author gives the description and measurements of the LiWong Museum specimen.)

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(This standard "check-list" has been revised by the leading Japanese ornithologists at ten year intervals (see historical sketch). All three editions cover Korea, as well as all other lands belonging to the former Empire at the time of publication. References to original descriptions include those synonyms whose type localities are in or near Japanese territory, and the location of the type specimen is given when known. "Approved" Japanese and English common names are supplied for each species and subspecies. Distribution within the Empire is delineated briefly, but extra-limital ranges are omitted, and the status of many forms within the area covered is poorly defined.)

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Tori, **3** (15), 1923, pp. 307–309.
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Berlin, pp. 1–2328; Nachtrag, 1923, pp. 1–92; Nachtrag (mit Dr. Friedrich Steinbacher), Heft 1–7, 1932–1938, pp. 1–602.
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Nov. Zool., **24**, 1917, p. 493.
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'Reports on Birds & Animals', Ministry of Agr. & Forestry, Tokyo, **6** (10), July 1930, p. 97; **6** (11), Jan. 1931, pp. 52, 97, 128;

7 (12), July 1931, pp. 315, 335, 265, 380; **7** (13), Oct. 1932, pp. 423, 474; **8** (1516), May 1935, pp. 23, 31, 49.

1936–1938. "Reports from Hachibi Island Lighthouse." (In Japanese.) 'Reports on Birds and Animals,', Ministry of Agr. & Forestry, Tokyo, **9** (17/18) Mar. 1936, pp. 65, 76, 92, 97, 98, 102, 130, 141, 146; **10** (19/20), Mar. 1937, pp. 4, 39, 67; **11** (21/22), Mar. 1938 pp. 35, 77; **12** (23/24), Mar. 1938, pp. 5, 31, 82.
(Sight records of birds observed by the lightkeeper who shipped so many specimens to Uchida in the flesh, and who seems to have had a good knowledge of local common birds. Contains valuable arrival and departure dates for many unmistakeable species. Those observations for species difficult to identify, or in any other way questionable, have not been included in the systematic account. Good notes on the breeding of *Locustella ochotensis pleskei*, *Synthliborhamphus antiquus*, *Micropus pacificus* and *Puffinus leucomelas*.)

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Journ. für Orn., **51**, 1903, pp. 394–404.
(Assigns Korean Nuthatches to *Sitta europaea amurensis*.)

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1887. "Nouvelle espèce d'aigle de Tartarie"
Le Naturaliste, **9**, no. 8, 1887, p. 95.
(Original description, from a living specimen in Shanghai, of *Haliaeetus niger* from Korea.)

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Zool. Mag., **24** (280), 15 Feb. 1912, pp. 103–104.
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1914. "Large Bean-goose in Korea, *Melanonyx arvensis sibiricus* Alph." (In Japanese.)
Zool. Mag., **26** (304), 15 Feb. 1914, pp. 82–83.
(First Korean record for the Siberian race.)

1914. "The Magpie and its Nest in Korea." (In Japanese.)
Zool. Mag., **26** (305), 15 March 1914, pp. 105–108, 1 txt. fig.
(A general account, in popular form, of the Magpie's habits and nesting, with photograph of a mounted bird, but no dates or localities.)

Iizuka, Akira, Taka-Tsukasa, N., Kuroda, N., and Shimokoriyama, S.

1914. "Handlist of the Birds of Korea." (In Japanese.)
Zool. Mag., **26** (306), 20 April 1914, pp. 157–180.

(First such list made by the Japanese, a careless paper containing many errors, an unannotated nominal catalogue, without dates, localities, or authorities for the species listed. It gives an accepted scientific name in Romaji, followed by a few synonyms and a Japanese name in Hiragana. Primarily the work of the junior author. See historical sketch.)

Ishizawa, Takeo (see also Kobayashi and Ishizawa)

1933. "On the Breeding of *Locustella ochotensis pleskei*." (In Japanese.) Tori, **8** (36), 1933, pp. 67–71.
(Detailed description of its nesting in Korea.)

1933. "Life History of *Synthliboramphus antiquus*." (In Japanese.) Plants and Animals, Tokyo, **1**, (2), 1933, pp. 279–280.
(Details on nesting in southwestern Korea.)

Journal of the Chosen Natural History Society. (In Japanese.)

1923–1944. Formerly published by the Society of Seoul.
(Numerous references to Korean birds from this journal appear under their respective authors. The periodical appeared irregularly, apparently as material was available, and all issues are numbered consecutively from No. 1 in 1923 to No. 40, the last one issued in September, 1944.)

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Jouy, Pierre Louis (See also Clark, A. H.)

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Kaidori [*The Cage Bird*]. (In Japanese.)

1921–1938. Formerly published by the Bird Society, Tokyo.
(A journal edited by Mr. Takayo Takano and devoted to aviculture, a popular Japanese hobby. It contains occasional data of value to the systematic ornithologist, on collecting of wild stock in the field. Only fifteen numbers were published, in two volumes. Vol. I numbers 1 to 5 run from November 1921 to March 1924. Vol. II numbers 1 to 10 run from September 1925 to September 1938.)

Kobayashi, Keisuke, and Ishizawa, Takeo

1932–1940. "The Eggs of Japanese Birds." (In English.)
(2 vols, 8vo, parts 1–16, published in parts in Kobe, Japan, at intervals from April 1932 to March 1940, pp. 1–235, col. plates 1–67, photo plates 1–38, plus title page, preface, introduction, map, table of contents, index and errata sections, all separately paged.)

(The only major work on the subject, with excellent colored plates of eggs and photographs of nests. The text gives habitat, breeding range, laying season, descriptions of eggs, nests and nest sites, partly culled from the works of others, but largely based on the senior author's collection and both men's field experiences. It contains a number of previously unpublished Korean records.)

KOBAYASHI, KENZO

1931. "A Partial List of Birds of Korea and Manchuria observed in early spring." (In Japanese.)
Tori, **7** (31), May 1931, pp. 73–78.
(Sight records for waterfowl and a few upland species, with some good arrival and departure dates, reliable for the more common and unmistakable species, but marred by use of loose common names which are now unidentifiable).

1932. "[A letter to a Mr. Kishida]" (In Japanese.)
'Collected Reports on Birds and Animals'; Agr. & For. Ministry, Animal Dept., Tokyo, **6** (10), Jan. 1930-June 1931 (1932), pp. 70, 71.
(Random notes on the waterfowl flight in late March in Hwanghae Do, good for their arrival and departure dates of the well-marked, unmistakable species.)

KURODA, NAGAMICHI (see also TAKA-TSUKASA & KURODA, and IIZUKA & others)

1913. "Bean Goose in Japan." (In Japanese.)
Zool. Mag., **25** (295), 15 May 1913, pp. 298–300.
(Review of the known Japanese and Korean specimens, revising their systematics and common Japanese names.)

1913. "Dotterel and Grey Tern." (In Japanese.)
Zool. Mag., **27** (298), 15 Aug. 1913, pp. 419–421.
(Adds the Dotterel to the list of Korean birds.)

1916. "Pelican in Korea, *Pelicanus crispus*." (In Japanese.)
Zool. Mag., **28** (331), 15 May 1916, p. 189, 1 text fig.
(The only Korean record, with photo of the mounted bird.)

1917. "First Korean Records for Two Species of Birds." (In Japanese.)
Zool. Mag., **29** (341), 15 March 1917, pp. 95–96.
(Reports *Gypaetus barbatus* and *Grus nigricollis*, from information Mori sent him by mail. Mori published the same data in Tori a month later.)

1917. "One New Genus and Three New Species of Birds from Korea and Tsushima." (In English.)
Tori, **1** (5), Dec. 1917, pp. 1–6, 2 txt figs.
(Original descriptions of *Pseudotadorna cristata* (duplicated in Japanese in the next title), *Parus major quelpartensis* and *Zosterops palpebrosa ijimae*.)

1917. "The Birds of Korea and Manchuria." (In Japanese.)
7th special publ. of Orn. Soc. of Japan, Tokyo, 28 Dec. 1917, pp. 1–82 and 1–95, numerous txt figs.
(This is the first major Japanese work on Korean birds. The systematic section lists 340 species and subspecies for Korea, fully documented with references. There are separate sections devoted to an annotated bibliography, a diary of his trip, field notes, and comments on his specimens.)

1918. "Additions to the list of Korean Birds." (In Japanese.)
Zool. Mag., **30** (357), 15 July 1918, pp. 289–292.
(Brings his previous work up to date by adding the 17 species missing from it in the almost simultaneous Shimokoriyama list, plus two species, the Snow Goose and the Long-tailed Rosy-finch missing from both.)

1918. "Notes on Corean and Manchurian Birds." (In English.)
Annot. Zool. Jap., **9** (4), 1918, pp. 495–573.
(An English edition, for occidental consumption, of the essential parts of the original 1917 *opus*. It comments on 204 species and subspecies in the systematic list, those from both Korea and Manchuria combined, instead of separately as in the Japanese version. Records from earlier literature are omitted, and no account is given of his own trip, but more details of his own collecting are included, and a few sources are quoted which were omitted from the original, such as the specimens given him by Mori and Y. Kuroda, and those reported from the LiWong and the Seoul School and Scientific Society collections.)

1920. "On the Sexual Differences of *Pseudotadorna cristata* Kuroda." (In Japanese.)
Tori, **2** (9), 14 April 1920, pp. 239–242, 2 text figs.
(Description of the male, as figured in a mediaeval Japanese print.)

1920. "Scientific Names and Distribution of Several Birds." (In Japanese.)
Zool. Mag., **32**, 1920, p. 409.
(Systematic notes on several specimens of *Emberiza schoeniclus*, *E. pallasi* and *E. yessoensis* from Korea, for which no collection data are given.)

1921. "Description of Seven New Forms of Japanese and Korean Picidae." (In English.)
Auk, **38**, 1921, pp. 575–582.
(Describes from Korea *Dryoscopus martius morii* and *Dryobates major hondoensis*.)

1923. "Description of two apparently new Forms of *Aegithalos caudatus* from Japan and Korea." (In English.)
Auk, **40**, 1923, p. 312.
(Describes *Aegithalos caudatus shimokoriyamae* from central Korea.)

1923. "The Birds at Nishi Island Lighthouse in Hwanghae Do." (In Japanese.)
Tori, **3** (15), July 1923, pp. 309–314.
(Data on nesting of White-rumped Swift, Ancient Murrelet and Black-tailed Gull, sent him, with specimens, by the light keeper from Nishi (West) Island.)

1924. "A Note on the Japanese Quail." (In English.)
Auk, **41** (1), Jan. 1924, pp. 116–123.
(Color differences, measurements and ranges are given from the study of a large series of *C. c. coturnix* and *C. c. japonicus*.)

1924. "A List of the Birds Preserved in Kyoto University Science College." (In Japanese.)
Tori, **4** (16, 17), 1924, pp. 68–90.
(The collection contains specimens of 18 species from Korea. No data given.)

1924. "On a Third Specimen of rare *Pseudotadorna cristata* Kuroda." (In Japanese and English.)
Tori, **4** (18), Oct. 1924, pp. 171–184, 1 col. pl. and 4 text figs.
(From Cholla Pukto comes the first known male specimen.)

1926. "A Monograph of the Pheasants of Japan." (In English.)
4to, Tokyo, 1926, pp. 1–43, pl. I–XV.
(A sumptiously illustrated, privately printed compilation of all the information available on the pheasants of Japan, including Korea and Formosa.)

1927. "A List of the Birds described by the Author during the ten years from 1915 to 1925, with descriptions of two new forms." (In English.)
Ibis, 1927, pp. 691–723.
(Includes the seven subspecies and one species he described from Korea.)

1932. "Eastern Little Owl in Korea." (In Japanese.)
Zool. Mag., **44** (523), 15 May 1932, pp. 192–193.
(Description of specimens sent him by Won, who also published the same information almost simultaneously in two different papers.)

1932. "A Revision of the Types of Birds Described by Japanese Authors during the Years 1923 to 1931." (In English.)
Nov. Zool., **37**, June 1932, pp. 384–405.
(Recognizes two of Yamashina's and one of Momiyama's proposed Korean races, and invalidates nine of the latter's.)

1933–1934. "Birds in Life Colors" (In Japanese.)
4to, Tokyo, **1**, 1933, pl. 1–371; **2**, 1934, pl. 372–732; **3**, 1934, pl. 733–1092.
(A popular work containing colored plates of almost all the species known in the "Empire", with brief text comments on habits and life histories.)

1934. "Notes on the breeding grounds of certain species of Anatidae in Japanese Territory." (In English.)
Proc. 5th Pac. Sci. Congress (Vancouver, 1933), **5**, 1934, pp. 4087–4094.
(Summarizes the known information on breeding of waterfowl within the "Empire"; in Korea the Spot-billed Duck is the only breeding species.)

1934. "The Specimens of Lesser White-fronted Goose in Japan." (In Japanese.)
Tori, **7** (38), April 1934, pp. 282–284.
(The two Kyonggi Do specimens were destroyed by the Tokyo earthquake in 1923.)

1934. "A Nominal List of Limicolae preserved in the Author's Collection." (In English.)
Tori, **8** (39), Nov. 1934, pp. 328–343.
(No data given for the specimens of 21 species listed from Korea.)

1938. "A consideration on the Water-cock (*Gallicrex cinerea.*)" (In Japanese.)
Tori, **10** (47), Nov. 1938, pp. 130–150, pl. 4, text figs.
(A short monograph on the taxonomy and life-history of the species, listing all data available on 28 Korean specimens.)

1939. "Geese and Ducks of the World". (In Japanese.)
4to, Tokyo, Feb. 1939, unpaged, with 121 black and white plates of photos and drawings, a page of descriptive text with each, and 19 numbered pages describing 65 varieties of domesticated waterfowl.
(The most complete and authoritative work on the subject in Japanese, largely a compilation of previously published material.)

1940. "An Old Record for a Pair of *Pseudotadorna cristata* obtained near Hakodate." (In Japanese.)
Tori, **10** (50), Sept. 1940, pp. 739–741, figs. 135, 136.
(A drawing and description made about 1820 prove the former occurrence of this rare duck near Hakodate, Hokkaido.)

1942. "A Bibliography of the Duck Tribe." (In English and Japanese.)
8vo, Tokyo, Oct. 1942, pp. 1–852.
(An exhaustive compilation of 6539 titles on the ducks, geese and swans, listed chronologically from 1849 to 1940, exclusive of those contained in Phillips' (1926) bibliography. Brief abstracts are included for the more important papers, but while those in English, French, German and other "foreign" tongues are all abstracted in English, the titles in Japanese are listed and annotated in Japanese only, and hence will be difficult for occidental students to use.)

KURODA, NAGAMICHI, and MORI, TAMEZO

1922. "On some New and Rare Birds from Corea." (In English.)
Auk, **39**, July, 1922, pp. 364–366.
(*Testrastes bonasia coreensis* and *Dryobates major seoulensis* proposed as new, and a single specimen of *Dryobates major brevirostris* reported from Seoul.)

1924. "Description of a Subspecies of *Sittiparus varius* from the Korean Peninsula." (In Japanese, with English summary.)
Zool. Mag., **36** (430), 15 Aug. 1924, pp. 314-318.
(*S. v. koreensis* proposed, and all the other races briefly reviewed.)

1927 "A young Three-toed Woodpecker and other Birds collected in northern Korea." (In Japanese.)
Tori, **5** (23), June 1927, pp. 290–292.
(An account of the collection by Won of a juvenal Three-toed Woodpecker, a White-backed Woodpecker and a Northern Tree Pipit, all new to the peninsula.)

KURODA, YASUKICHI

1918. "Observations on the Habits of Korean Birds." (In Japanese.)
Tori, **2** (6), May 1918, pp. 19–25.
(Random notes on a number of common species; some of the sight records, especially of waterfowl, are questionable, and the use of loose Japanese names for the birds makes identification impossible in several instances.)

1928. "On the Food and Habits of the Common Quail in Korea." (In Japanese.)
Tori, **5** (25), March 1928, pp. 469–484.
(Inexpert observations on *Coturnix*, giving but little accurate data, and stating several conclusions unwarranted by the evidence (they disappear into the mountains in winter!) A partial analysis of crop and gizzard contents.)

1928. "Supplement to Treatise on Food of Quail in Central Korea." (In Japanese.)
Tori, **6** (26), Dec. 1928, p. 53.
(A list of identifications, by an un-named botanist, of the vegetable remains mentioned in the previous paper.)

1930. "Korean Black Stork." (In Japanese.)
Tori, **6** (29), April, 1930, p. 360.
(Describes a juvenal specimen taken in Chungchong Pukto.)

1930. "Revision and Addition to the Food of Quail in Central Korea." (In Japanese.)
Tori, **6** (29), April 1930, p. 362.
(A new table on the 1928 subject.)

1935. "The Korean Hazel Grouse." (In Japanese.)
Tori, **8** (40), May 1935, pp. 518, 519.

(Notes from Kangwon Do on its habits in spring; also sight records for a few other common species.)

1935. "The Measurements of *Grus vipio* in Korea." (In Japanese.) Tori, **9** (41), Dec. 1935, pp. 84–85.
(Complete measurements of thirty specimens, with a few notes on each.)

1935. "A Report on Zokuri Sanctuary in Korea." (In Japanese.) Tori, **9** (41), Dec. 1935, pp. 86–88.
(General description of the sanctuary in Chungchong Pukto, and a list of 48 species of birds observed there during a visit 24-26 May 1931.)

1937. "The White-naped and other Cranes in Korea." (In Japanese.) Tori, **9** (44), June 1937, pp. 307–312.
(Excellent detailed observations, mostly on *Grus vipio*, but with notes on the other three species as they occur in Chungchong Pukto. Abundance, arrival and departure dates, local distribution, food and other factors influencing their habits, likewise their senses of smell, sight and hearing are discussed with the authority of long experience with the birds in the field.)

1937. "The Japanese Quails in Korea." (In Japanese.) Tori, **9** (44), June 1937, pp. 313–319.
(A mature and accurate account of the movements of *Coturnix* in Chungchong Pukto, in welcome contrast to his paper a decade earlier on the same subject. A pronounced autumn migration, but no discernible spring flight; their presence during shooting season largely dependent on available food supply.)

Kuroda, Yasukichi, and Miyakoda, Jinzaburo

1919. "Migration of common Birds near Seoul." (In Japanese.) Tori, **2** (8), July 1919, pp. 148–151.
(A date chart, slightly annotated, for some 70 species, based mostly on sight records (and perhaps guesswork), many of which are open to question.)

Lavauden, Louis

1924. "Note sur le Pygargue de Corée (*Haliaetus niger* Huede)." Ann. Mus. Hist. Nat. Marseille, **19**, 1924, pp. 1–5, pl. 1.
(Notes on the specific validity of *H. niger*, giving measurements of the Marseille Museum specimen, which is compared with those of the Taczanowski and Zikawei specimens. Mentions other captive birds in the Hamburg, Berlin and London zoos.)

Linsdale, Jean M.

1937. The Natural History of the Magpies." Pac. Coast Avif., No. 25, Cooper Orn. Club, Univ. Cal. Mus. Vert. Zool., 24 Aug. 1937, pp. 1–34.

(A scholarly account, based mostly on the Nearctic representatives, but with a complete review of the literature on the eastern Asiatic and all other forms.)

LYNES, H.
1930. "Review of the Genus Cisticola."
Ibis, Ser. 12, **6**, 1930, suppl., pp. 1–673.

MANIWA, GUNICHI
1918. "[Answers to Questions.]" (In Japanese.)
Tori, **2** (7), 1918, pp. 134–135.
(Miscellaneous data on cranes in southern Korea, body weights, arrival and departure dates, habits in captivity.)
1930. "The Nest of the Magpie." (In Japanese.)
Tori, **6** (30), Nov. 1930, p. 429, 1 text fig.
(Photo of a poplar tree with four magpie nests, one above the other.)

MEINERTZHAGEN, R.
1923. "A review of the Genus Oriolus."
Ibis, Ser. 11, **5**, 1923, pp. 52–96.
(*O. c. indicus* "apparently not seen yet except on passage in Corea. . . .")

MEISE, WILHELM
1934. "Die Vogelwelt der Mandschurei."
Abh. und Ber. Mus. Tierk. Volkenk. Dresden, **18**, 5 July 1934 (2), pp. 1–86.
(Discusses the systematics of a number of Korean forms.)

MOMIYAMA, TOKUTARO
1917. "A new Locality for the Old Squaw." (In Japanese.)
Tori, **1** (4), April 1917, p. 44.
(First Korean record for *Clangula hyemalis*.)
1920. "Notes on some Strigidae." (In Japanese.)
Tori, **2** (10), Dec. 1920, pp. 309–312, fig. 48.
(Remarks on three specimens of *Strix uralensis* from northern Korea.)
1927. "Four new Subspecies of Korean Birds." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (4), 10 Jan. 1927, pp. 1–6.
(Describes four fancied races, of Ural Owl, Pigmy Woodpecker, Meadow Bunting, and Brandt's Jay.)
1927. "Descriptions of four new Forms of *Corvus coronoides* from Quelpart, Sakhalin, Hondo and Kiusiu." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (5), 10 June 1927, pp. 1–6.
(Over-fine splitting, subsequently disallowed by his compatriots.)
1927. "Some new and unrecorded Birds from Japanese Territories. I." (In Japanese.)

Annot. Orn. Orient., **1** (1), 27 Dec. 1927, pp. 1–79.
(Proposes names for two titmice and a creeper from Korea, now in synonymy.)

1927. "Description of twenty-five new Birds and three Additions from Japanese Territories." (In English.)
Annot. Orn. Orient., **1** (1), 27 Dec. 1927, pp. 81–102.
(English version of the preceding, somewhat edited, corrected and abridged for foreign consumption.)

1927. "[Descriptions of new Birds from Japan.]" (In English.)
Bull. Brit. Orn. Club, **48**, 1927, pp. 19–22.
(Describes *Strix uralensis morii*, now in synonymy.)

1928. "New and known Forms of the Ural Owl (*Strix uralensis*) from southeastern Siberia, Manchuria, Korea, Sakhalin and Japan." (In English.)
Auk, **45**, 1928, pp. 177–185.
(Reviews the literature, and recognizes twelve races, only five of them not his own; proposes three new races, one of them not named because he had no specimen, but had just observed the bird in the field as different.)

1928. "A Catalogue of the Bird Skins made by Mr. Matakichi Tatibana in southern Sakhalin during May 1926 to Jan. 1927." (In Japanese and English.)
Annot. Orn. Orient., **1** (2), 25 Jan. 1928, pp. 171–239.
(Describes *Parus major takahashi* from Seoul, rectifying the *nomen nudum* he proposed in 1927.)

1928. "Twelve Forms of Japanese Birds." (In Japanese and English.)
Annot. Orn. Orient., **1** (4), 31 Dec. 1928, pp. 419–456.
(Lists specimens and gives descriptions of *Cyanoptila cyanomela intermedia* (Weigold) and *Urosphena squameiceps ussuriana* (Seebohm) from Korea, and *Turdus eunomys ni* Moniyama from Quelpart "and perhaps Korea?".)

1929. "The Pitta, (*Pitta nympha nympha* Temm. & Schleg.)" (In Japanese.)
Amoeba, **1** (2), 1929, pp. 28–37.
(An account of the Pitta in Japanese territory, listing the Korean records.)

1931. "On a Family of Nuthaches [sic] in Japan." (In Japanese and English.)
Kaidori, Tokyo, **2** (8), 1931, pp. 1–24.
(Proposes *Sitta villosa yamashina* and *Sitta europa buturlini*, now disallowed.)

1932. "The Geographical Distribution of the Birds of Botel Tobago." (In Japanese and English.)
Bull. Biogeogr. Soc. Japan, **2** (3), p. 315.
(Proposes *Microscelis amaurotis coreensis*, a *nomen nudum*, for the wintering Korean bulbuls.)

1937. "On the Hydrobatidae of Japan." (In Japanese.)
Zool. Mag., 49 (3/4), 1937, pp. 99–101.
(Lists *Oceanodroma monorhis* from southwestern Korea.)

Mori, Tamezo (see also Kuroda, N. and Mori)

1916. "List of Vertebrate Animals of Korea." (In Japanese.)
'Lecture Materials' published by the government, Seoul, 1916.
(Includes a nominal list, without sources, of 306 species and subspecies of birds, with Korean and Japanese names for most of them.)

1917. "New Locality for the Bearded Vulture." (In Japanese.)
Tori, 1 (4), April 1917, pp. 41–42.
(Repeats data written to and published by N. Kuroda.)

1917. "A rare Crane collected in Korea." (In Japanese.)
Tori, 1 (4), April 1917, pp. 43, 44.
(Repeats data written to and published by N. Kuroda.)

1917. "List of Birds collected along the Coasts of Pyongan Pukto, Pyongan Namdo and Hwanghae Do in Korea." (In Japanese.)
Tori, 1 (5), Dec. 1917, pp. 72–74.
(An unannotated list, by Japanese common names only, of 63 species collected from April to July 1917, evidently for the Seoul School collection. Gives no data on dates or localities.)

1918. "A Japanese Grosbeak." (In Japanese.)
Tori, 2 (6), May 1918, pp. 53–54.
(He bought one in the Seoul market.)

1918. "Abnormal underplumage in a White-fronted Goose." (In Japanese.)
Tori, 2 (7), Sept. 1918, p. 130, 1 txt fig.
(Description and picture of a male goose with completely black underparts, bought in Seoul Market, 13 Feb. 1918.)

1918. "A Curious Bird, the Pitta." (In Japanese.)
Chosen Bull., Seoul, Nov. 1918, pp. 1987–1990, with col. pl.
(Not uncommon in southern Quelpart Island, rare in mainland Korea.)

1920 "White-winged Black Tern." (In Japanese.)
Tori, 2 (9), April 1920, pp. 252–253.
(Description and measurements of three Korean specimens.)

1920. "The Red-spotted Blue-throat." (In Japanese.)
Tori, 2 (10), December 1920, p. 319.
(Measurements and description of the only Korean specimen.)

1923. "Catalogue of Specimens at the Exhibition of Specimens of the Natural History of Chosen." (In Japanese.)
Chosen Nat. Hist. Soc. publ., Keijo, 1923, pp. 1–95.
(The avian section, pp. 27–46, lists scientific and common Japanese names for 371 Korean forms. For each species on exhibition (most are from the Seoul School collection) one locality is given, with

no further data. Species previously recorded from Korea but not represented in the collection are merely listed without comment.)

1925. "The Pheasant in Korea." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (3), 15 Dec. 1925, pp. 21–34, map and text figs.
(A careful study of the variations of Korean specimens of *Phasianus colchicus*. Its well thought-out conclusions have not been altered materially by any of the later revisions.)

1927. "Relation between Bird Food and Agriculture." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (5), 10 June 1927, p. 85.
(Crop and stomach contents of Black Grouse, Bustard, Short-eared, Ural and Wood Owls.)

1927. "The Food of the Korean Hazel Grouse." (In Japanese.)
Tori, **5** (23), June, 1927, pp. 285–286.
(Crop and stomach contents of two birds from Kangwon Do, and one from Hamgyong Pukto.)

1927. "The Nest and Eggs of the Little Ringed Plover." (In Japanese)
Tori, **5** (24), Nov. 1927, pp. 388–389, 1 text fig.
(Details, with photograph, of a nest on the Han River, near Seoul.)

1928. "First Collection of the Black-winged Stilt in Korea." (In Japanese.)
Tori, **5** (25), March, 1928, pp. 490, 491, 1 text fig.
(Short note, giving full data and picture of the specimen.)

1929. "Two new Additions to the List of Japanese Birds and three new Records for the Korean Avifauna." (In Japanese.)
Tori, **6** (27), April, 1929, pp. 100–108, 1 col. pl.
(Description, with English summary, of *Lyrurus tetrix koreensis*, and first Korean records of *Sturnia sturnina*, *Sturnia philippensis*, *Streptopelia t. humilis*, *Pericrocotus r. tegimae*, and *Nycticorax n. nycticorax*.)

1932. "Korean Black-cock, *Lyrurus tetrix koreensis* Mori kept in captivity." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (13), Apr. 1932, pp. 26, 27.
(Notes on a captive bird kept by a Japanese high school principal in Hamgyong Pukto. Describes cage, feeding, voice, and general behavior in captivity.)

1933. "Black-cock occurs in Hamgyong Namdo." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (15), 1933, pp. 97–98.
(Short note, giving southernmost record for the species.)

1935. "On the Birds and Mammals collected by the Expedition of Kyoto University to Paekto-San in Winter." (In Japanese.)
Journ. Chosen. Nat. Hist. Soc. (20), 1935, pp. 10–12.
(Lists, with a few comments but without essential data, the specimens of eight species collected by the expedition, which

climbed the mountain between December 1934 and mid-January 1935.)

1938. "On the Breeding Ground and Habits of *Ciconia nigra*." (In Japanese.)
Tori, **10** (47), Nov. 1938, pp. 127–129, 1 text fig.
(Notes on nests found on a cliff near Andong, Kyongsang Pukto.)

1939. "Bird Conservation in Korea." (In Japanese.)
Yacho, **6** (1), Jan. 1939, pp. 1–11, map and 3 text figs.
(A plea for protection and conservation of certain valuable species, meant for lay reading, but containing the best data available on some of the water-bird colonies, and an excellent account of the history and habits of Tristram's Woodpecker.)

Morikawa, Tsutomu

1925. "On the Distribution of *Phasianus colchicus karpowi* and *pallasi*." (In Japanese.)
Tori, **4** (19), April 1925, pp. 251–261.
(Conclusions based on the examination of a tremendous series of specimens from the Korea-Manchuria border by the principal of the Chosen School in Chunchun, Manchuria, who was evidently not a scientist. A letter from N. Kuroda follows the paper, pointing out its errors and discrepancies.)

Nishioka, Kankichi

1932. "Concerning the Broad-billed Roller." (In Japanese.)
Zool. Mag., **44** (523), 15 May 1932, pp. 197–198.
(A general account of the species' distribution, mainly outside Korea, but mentioning its status there briefly.)

Oberholser, Harry C.

1925. "Description of a New Oriolus."
Proc. Biol. Soc. Wash., **38**, 1925, pp. 5–6.
(Proposes *O. c. ochroxanthus*, now in synonymy, from Jouy's old skins.)

Ogilvie-Grant, William Robert

1906. "Mr. Ogilvie-Grant describes a new species of the Nuthatch from Corea . . ."
Bull. Brit. Orn. Club, **16**, 1905–6 (1906), p. 87.
(Description of *Sitta corea*, sp. n., now of subspecific rank.)

Ornithological Society of Japan

Publishers of "Tori" [The Bird], the principal Japanese ornithological periodical, also a series of special publications in memoir form, and the "Hand-List of Japanese Birds", a new and revised edition of which has appeared at ten year intervals, the third and most recent in 1942.

Phillips, John C.

1923–1926. "A Natural History of the Ducks."
London, 4to, Vols. 1–4.
(Contains no previously unpublished material on the waterfowl in Korea, but gives most of the references to data available in all languages except the Japanese. Kuroda's notes on *Pseudotadorna* and a fine plate of this rarity are included.)

Reichenow, A.

1917. "[Über Abarten der *Passer montanus*.]"
Journ. für Orn., **65**, 1917, p. 115.
(Passing remarks on *P. m. dybowskii* Dom.)

Riley, J. H.

1915. "Descriptions of Three New Birds from China and Japan."
Proc. Biol. Soc. Wash., **28**, 1915, pp. 161–164.
(Describes *Tetrastes bonasia vicinitas*, *Dryocopus martius silvifragus* and *Eophona melanura sowerbyi*.)

1916. Description of a New Hazel Grouse from Manchuria.
Proc. Biol. Soc. Wash., **29**, 1916, p. 17.
(Original description of *Tetrastes bonasia amurensis*.)

Salvadori, T. (see also Giglioli and Salvadori)

1909. "Notes on the *Corvus neglectus* of Schlegel."
Ibis, 1909, pp. 34–137.
(Revision of the Jackdaws.)

Salvadori, T. and Giglioli, H. H.

1889. "Uccelli raccolti durante il Viaggio della Corvetta 'Vettor Pisani' negli anni 1879, 1880 e 1881."
Mem. R. Accad. Sci. Torino (2), **39**, 1889, pp. 99–143.
("Uccelli della Corea", pp. 138–141. Lists 24 specimens of 15 species, taken between 1 and 18 August, 1880.)

Sclater, P. L.

1893. "[A Young Corean Sea-Eagle]".
Proc. Zool. Soc. London, 1893, p. 613.
("*H. branickii*, obtained direct from Corea by the authorities of the Zoological Gardens of Hamburg, and purchased from them Sept. 21" for the London Zoo.)

1896. "List of the Vertebrated Animals in the Gardens of the Zoological Society of London."
9th edition, 1896, p. 387.
(Mentions the London specimen of *Haliaeetus niger*.)

Seebohm, H.

1894. "On the Chinese Species of the Genus Suthora."
Ibis, **6**, 1894, pp. 338–339.
(Synonymizes Campbell's *fulvicauda* and *longicauda* with *webbiana*.)

SHIMOKORIYAMA, SEICHI (see also IIZUKA et al.)

1913. "Crested Ibis in Korea." (In Japanese.)
Zool. Mag., **25** (292), 15 Feb. 1913, pp. 113, 114.
(A letter to Prof. Iizuka describes finding a concentration of several thousand ibises in Chungchong province, and collecting two of them.)

1917. "A List of the Bird Specimens in the LiWong Museum, Seoul." (In Japanese.)
Seoul, Korea, 8vo, Oct. 1917, pp. 1–84.
(Catalogues the 1900 skins of 318 species and subspecies in the collection by their accepted scientific names, with Japanese names in Hiragana, and complete data, sex, date and locality, for every specimen. A separate list contains the 38 species known at the time to have been recorded from Korea, but not represented in the collection.)

1918. "[Answers to questions.]" (In Japanese.)
Tori, **2** (7), 1918, p. 134.
(Body weight of Manchurian Crane in LiWong Zoo; a White-naped Crane laid a single egg there 10 May 1918; Manchurian Crane arrives in Hwanghae Do the end of October.)

SHULPIN, L.

1928. "Emberiza spodocephala extremi-orientalis, n. amend."
Orn. Monatsb., **36**, 1928, p. 82.

SLATER, H. H.

1897. "On a Further Collection of Birds, made by Messrs. LaTouche and Rickett, from N. W. Fokhien."
Ibis, Ser. **7**, **3**, 1897, pp. 169–176.
(Synonymizes Campbell's two races of *Suthora* with *S. webbiana*.)

SNOUCKAERT VAN SCHAUBERG, R. C. E. Q. J. BARON

1930. "De duiven van het geslacht *Columba* L."
Org. Cl. Nederl. Vogelk., **3**, 1930, pp. 12–36; 83–100; 158–178.

1937. "De geographische verbreiding der *Pycnonotidae* von Azié en den Indischen Archipel, VI."
Limosa, **10** (1/2), 1937, pp. 32–61.

SNYDER, L. H.

1937. "Catalogue of the Collection of Avifauna in the Wasson Museum of the Songdo High School, Songdo, Korea."
Small 8vo., Y.M.C.A. Press, Seoul, Korea, 1937, pp. 1–23.
(Specimens are listed with complete data; the scientific names in Romaji and the accepted common Japanese names in Kata-kana were evidently taken from the 1932 Hand-List of Japanese Birds; the dates are in English, but the localities are in Chinese characters.)

STEGMANN, B.

1927. "Die ostpaläarktischen Elstern und ihre Verbreitung."
Ann. Mus. Zool. Acad. Sci. URSS., **28**, 1927, pp. 366–390.
(Revision of the magpies, describing *P. p. jankowskii*, the Ussurian race whose range extends into northern Korea.)

1931. "Die Vögel des dauro-mandschurischen Uebergangsgebietes."
Journ. für Orn., **79**, 1931, pp. 137–236.
(Pertinent comments on the systematics of a number of forms whose ranges extend to Korea.)

1932. "Die geographischen Formen des Birkhuhns (*Lyrurus tetrix* L.)."
Journ. für Orn., **80**, 1932, pp. 342–354.
(Without Korean material, cannot judge validity of *L. t. koreensis* Mori.)

1934. "Ueber die Formen der grossen Möwen ("subgenus *Larus*") und ihre gegenseitigen Beziehungen."
Journ. für Orn., **82**, 1934, pp. 340-380.
(A subadult Herring Gull from Korea shows characters intermediate between *mongolicus* and *vegae*.)

1937. "*Charadrius mongolus litoralis* SUBSP. N."
Orn. Monatsb., **45** (1), Jan./Feb. 1937, pp. 25–26.
(Describes the northeastern Siberian race.)

STEJNEGER, L.

1888. "Review of Japanese Birds, VIII, The Nutcrackers."
Proc. U. S. Nat. Mus., **11**, 1888, pp. 425–432.
(Discusses systematics; first mention in literature of any of Jouy's Korean birds, the four Nutcrackers he collected near Fusan.)

1893. "Notes on a Third Installment of Japanese Birds in the Science College Museum, Tokyo, Japan, with descriptions of new Species."
Proc. U. S. Nat. Mus., **16**, 1893, pp. 615–638.
(Proposes *Columba taczanowskii*, sp. nov., from Jouy's Fusan specimen.)

STRESEMANN, E.

1913. "Ornithologische Miszellen aus dem Indo-Australischen Gebiet."
Nov. Zool., **20**, 1913, pp. 289–324.
(Korean Broad-billed Roller is an intergrade between *E. o. orientalis* and *E. o. calonyx*.)

1927. "Die Wanderungen der Rotschwanz-Wurzer."
Journ. für Orn., **75**, 1927, pp. 68–85.
(Refers Taczanowski's Korean specimens of Red-tailed Shrike to *lucionensis*.)

1940. "Die Rassen von Charadrius mongolus."
Orn. Monatsb., **48** (2), 1940, pp. 51–56.
(*C. m. stegmanni*, nom. nov. for *litoralis* Stegmann, preoccupied.)

Sushkin, Peter P.
1925. "Notes on Systematics and Distribution of Certain Palaearctic Birds."
Proc. Boston Soc. Nat. Hist., **38**, Aug. 1925, pp. 1–55.
(Contains notes on the specific affinities of the Bullfinches.)

Swann, H. Kirke, and Wetmore, Alexander
1924–1945. "A Monograph of the Birds of Prey."
4to, Parts 1–16, 1924–1945.
(Korean data are from previously published sources.)

Swinhoe, R.
1870. "A List of Birds collected by Mr. Cuthbert Collingwood during a Cruise in the China and Japan Seas, with notes."
Proc. Zool. Soc. London, 1870, pp. 600–604.
(Redstart, Kinglet and Brambling collected on outer islands off the coast are the only Korean specimens in the small list, the first from Korea.)

Taczanowski, M. L.
1887. "Liste des Oiseaux recuellis en Corée par M. Jean Kalinowski."
Proc. Zool. Soc. London, 1887, pp. 596–611.
(Notes on the 107 species in Kalinowski's first shipment of specimens; describes *Galerida cristata coreensis* and *Thriponax kalinowski*.)
1888. "Liste supplémentaire des Oiseaux recuellis en Corée par M. Jean Kalinowski."
Proc. Zool. Soc. London, 1888, pp. 450–468.
(Adds 72 species to the previous list and describes *Haliaetus branickii*; gives Kalinowski's field notes, and observations on species not collected.)
1889. "Description d'une nouvelle *Locustella* de la Corée."
Proc. Zool. Soc. London, 1889, pp. 620–621.
(Original description of *L. pleskei*.)
1893. "Faune Ornithologique de la Sibérie Orientale."
Mém. Acad. Imp. Sci. St. Petérsbourg, Ser. 7, tom. 39, pts. 1 & 2, 1893, pp. 1–1278.
(Korean references largely copied from his previous works.)

Taka-Tsukasa, Nobusuke (see also Iizuka, et al.)
1915. "Additions to the Bird List of Korea." (In Japanese.)
Zool. Mag., **27** (315), 15 Jan. 1915, pp. 35–36.
(Corrects fourteen errors in the 1914 Iizuka list, and adds four species to it.)
1919. "The Black Redstart." (In Japanese.)
Zool. Mag., **31** (363), 15 Jan. 1919, pp. 29–30.
(Only Korean record for *Phoenicurus ochruros rufiventris*.)

1925. "On a Specimen of *Pseudotadorna cristata* from Vladivostok." (In Japanese.)
Tori, **4** (20), Aug. 1925, pp. 358–366, 3 text figs.
(Notes on the specimen in the Zoological Museum, Copenhagen.)

1932–1943. "The Birds of Nippon." (In English.)
1, (a) & (b), pts. 1–8, pp. I–CLXXXIV and 1–456, 15 Aug. 1932-28 Feb. 1943, 4to, privately printed, Tokyo, numerous colored plates and photographs.
(The first volume (eight separately published parts bound into two quartos, a and b) of this monumental work contains an account of the physiography of Japan, a history of Japanese ornithology, and an excellent bibliography. The systematic portion covers only the gallinaceous birds, which are discussed in detail. The last half of vol. 1b consists of corrections and addenda to the earlier portions. The Korean forms are treated by a thorough compilation of previously published information.)

1944. "Studies on the Galli of Nippon." (In English.)
8vo, privately printed for the author, Tokyo, 31 January 1944, pp. 1–67, 5 col. pl.
(This revision of the systematics of the gallinaceous birds of the "Empire" presents no new data for the Korean forms, which are treated summarily on the basis of previously published material.)

Taka-Tsukasa, Nobusuke, and Hachisuka, Masauji

1925. "A Contribution to Japanese Ornithology." (In English.)
Ibis, 1925, pp. 898–908.
(Comments on the changes in status of a number of species, on the basis of data published previously only in Japanese; includes for Korea notes on *Pseudotadorna*, *Cygnus olor*, and, erroneously, *Eremophila alpestris*.)

Taka-Tsukasa, Nobusuke, and Kuroda, Nagamichi

1915. "List of the Birds of Korea." (In Japanese.)
in "Illustrated Birds of Japan" by S. Uchida, supplemental volume, 1915, pp. 189–220, and appendix 3, pp. 23–34.
(The first section gives general descriptions of Korean species that do not occur in Japan; the appendix contains an unannotated nominal list of 295 species and subspecies.)

1927. "List of the Birds of Korea." (In Japanese.)
in "Illustrated Birds of Japan" by S. Uchida, revised, supplemental volume, 1927, pp. 197–237, and appendix, pp. 1–14.
(Revision of the 1915 lists, the appendix increased to 379 forms.)

Temminck, C. J. and Laugier de Chartrouse

1827–1836. "Nouveau Recuéil de Planches Coloriées d'Oiseau."
Large folio, 5 vols, Paris.
(Japanese Murrelet, Temminck's Robin and Slender-billed Shearwater are described from "Corée".)

TEMMINCK, C. J. and SCHLEGEL, H.
1833–1850. "Aves" in Siebold's "Fauna Japonica."
Japanese edition, 300 copies, printed 1 Oct. 1934.
(Describes the Pitta as from "Corée".)

TICEHURST, CLAUD B.
1938. "A Systematic Review of the Genus Phylloscopus."
London, 8vo, 1938, pp. 1–193, pl. I & II.
(Most recent and finest revision of this most difficult group.)

Tori, [*The Bird*]. (Papers in Japanese and English.)
Official organ of the Ornithological Society of Japan, published by the Society in Tokyo at irregular intervals; all Korean references have been extracted from a complete file running from Vol. I No. 1, Jan. 1915, to Vol. XI, No. 55, Sept. 1944, and are listed under their various authors.

Transactions of the Chosen Natural History Society. (In Japanese.)
1937–1939. Formerly published by the Society in Seoul.
(The Society evidently issued this periodical primarily to record minutes of meetings and annual membership lists. Only five numbers were issued, from January 1937 to January 1939. They contain a few minor papers, too short for inclusion in the Journal, three of them containing brief notes on birds.)

TRISTRAM, H. B.
1885. "On a Small Collection of Birds from Korea."
Ibis, 1885, pp. 194–195.
(A nominal list of eight specimens of as many common species, without data, collected somewhere along the Korean coast, by the crew of H. M. S. "Flying Fish".)

UCHIDA, SEINOSUKE
1915. "The Illustrated Birds of Japan."
8vo, Tokyo, Vols. I, II and Suppl.
(Contains Taka-Tsukasa and Kuroda's "List of the Birds of Korea".)
1918. "Concerning Kuroda's Sheldrake, *Pseudotadorna cristata* Kuroda."
Tori, **2** (6), May, 1918, pp. 6–12, 2 text figs.
(Notes on Pseudotadorna from ancient writings and pictures.)
1927. "The Illustrated Birds of Japan." (Revised ed.)
8vo, Tokyo, Vols. I, II and Suppl.
(Contains Taka-Tsukasa and Kuroda's revised "List of the Birds of Korea".)

UEKI, H.
1932. "About the Keeping of the Black-cock." (In Japanese.)
Journ. Chosen Nat. Hist. Soc. (13), 1932, pp. 26, 27.
(Notes on a pair from Hamgyong Pukto kept in captivity.)

UNDERWOOD, H. H.

1915. "Hunting and Hunter's Lore."
Trans. Korean Roy. As. Soc., **6** (2), 1915, pp. 1–21.
(Not seen, but reported to contain a few bird observations.)

WON, HONG KOO

1932. "Notes on the Eastern Little Owl, *Athene noctua plumipes* from Korea." (In Japanese.)
Tori, **7** (33/34), May 1932, pp. 278–280.
(*Cf.* Kuroda's simultaneous paper in the Zoological Magazine on the same subject.)

1932. "Swallow Plover Collected in Korea for the First Time." (In Japanese.)
Zool. Mag., **44** (524), 15 June 1932, pp. 242–243.
(Short account of how this species was added to the Korean list.)

1932. "Two species of Birds to be added to the List of Korean Birds." (In Japanese.)
Sci. Papers, 25th Ann. Suigen [Suwon] Agr. & For. Coll. 1932, pp. 1–4.
(Repeats the information in the preceding two titles, adds a third specimen of the Eastern Little Owl, and gives a few random notes on other species, mostly shorebirds and herons.)

1932. "A List of Korean Birds collected by the Author." (In Japanese.)
Sci. Papers, 25th Ann. Suigen [Suwon] Agr. & For. Coll., 1932, pp. 27–48.
(A nominal list, without data, of 245 forms, with Japanese and Korean names added. A short introduction reviews the history of Korean ornithology briefly, and gives an interesting account of the author's trials and tribulations as a bird student.)

1932. "Migration Route of the Pitta in Korea." (In Japanese.)
Zool. Mag., **54** (528), 15 Oct. 1932, p. 397.
(A novel theory, hardly justified by the evidence. Contains the third record for this straggler in Korea proper.)

1934. "Two Species new to the List of Korean Birds." (In Japanese.)
Zool. Mag., **56** (543), 15 Jan. 1934, p. 17, 1 text fig.
(First records for Hoary Redpoll and Partridge Auklet.)

1934. "A Handlist of Korean Birds." (In Japanese.)
Bull. Kagoshima Imp. Coll. Agr. & For., Ded. to 25th Ann., **1**, Nov. 1934, pp. 77–118.
(An annotated list, with localities and a few terse notes on the status of each species, but no dates. In the Yamashina library is a unique copy in which, at Yamashina's request, the author has entered by hand the dates of his own specimens.)

1935. "Importance to Agriculture of Bird Preservation." (In Japanese.)
Zool. Mag., **47** (567), 15 Dec. 1935, pp. 200–202.
(A plea for bird protection, with a few dates on specimens collected for stomach analysis, and a summary of recommendations.)

1936. "Addition of one Species to the List of Korean Birds." (In Japanese.)
Zool. Mag., **48** (6), 15 June 1936, pp. 312–313, 1 text fig.
(Tries to assign an old specimen in his collection to *Falco peregrinus pealei*, disallowed by subsequent authors.)

1937. "Birds in Spring." (In Japanese.)
Trans. Chosen Nat. Hist. Soc. (2), Apr. 1937, pp. 3, 4.
(Brief notes on the breeding of *Eophona migratoria* and *Otus scops stictonotus*.)

1941. "Observations on the Breeding of *Sturnia sturnina*." (In Japanese.)
Tori, **11** (51/52), Oct. ,1941, pp. 90–98, 3 text figs.
(The author's experiences with a pair found nesting in central Pyongan Pukto, a detailed account of the first Korean breeding record for the species.)

Yacho [*The Wild Bird*]. (In Japanese.)
Tokyo, Vol. 1 (1), May 1934, to Vol. 11 (115), Sept. 1944. (All published.)
(A semi-popular periodical, published in Tokyo and produced and edited by Godo Nakanishi. Most of its articles are of a popular nature. It contains excellent photographs, considerable poetry, and an occasional article of value scientifically based on first-hand observations.)

YAMASHINA, YOSHIMARO

1927. "Two Species of Korean Birds." (In Japanese.)
Tori, **5** (24), Oct. 1927, pp. 373–374.
(First Korean records for the Willow Tit and Japanese Skylark.)

1929. "Several Birds collected in Korea." (In Japanese.)
Tori, **6** (28), Dec. 1929, pp. 168–171.
(First brief report on the results of Orii's collecting in Pyongan Pukto. Notes on eight species new to or rare in Korea.)

1930. "Twelve Forms of Birds new to Korean Avifauna." (In Japanese.)
Tori, **6** (29), April 1930, pp. 251–260, 2 text figs.
(Describes *Dryobates minor nojidoensis* and *Picoides tridactylus kurodai*, and gives first Korean records of ten other species.)

1931. "Six Birds newly added to the Avifauna of Japan." (In Japanese.)
Tori, **7** (31), May 1931, pp. 1–5.
(New to Korea are *Dryobates leucotos uralensis* and *Lanius cristatus confusus*.)

1931. "Notes on *Tringites subruficollis* and *Pisobia maculata*." (In Japanese.)

Tori, **7** (31), May 1931, pp. 72–73.
(American Pectoral Sandpiper from Hamgyong Pukto.)

1931. "A new Korean Subspecies of Japanese Pigmy Woodpecker." (In Japanese.)
Tori, **7** (32), Dec. 1931, pp. 111–112, 3 text figs.
(Describes *Dryobates kizuki acutirostris* from Kangwon Do.)

1932. "On the Specimens of Korean Birds collected by Mr. Hyojiro Orii." (In English.)
Tori, **7** (33/34), May 1932, pp. 213–252.
(Collection data and critical systematic comment on the 1940 Korean specimens of 279 species and subspecies collected by Orii from April 1929 to March 1930 in Pyongan Pukto, Hamgyong Pukto, Kangwon Do, Cholla Namdo, and Quelpart Island.)

1933. "A Natural History of the Japanese Birds." (In Japanese.)
Vol. I, large 8vo, Tokyo, 1933, pp. 1–524, many col. pl. and text figs.
(The 1931 prospectus planned this opus in five volumes, the first three dealing with greater Japan (the four main islands, Sakhalin, Kuriles and Korea), the fourth embracing the Ryukyus, Formosa and China, the fifth on the Japanese Pacific Islands.)

1939. "Nesting of Redstart in Korea." (In Japanese.)
Trans. Chosen Nat. Hist. Soc. (6), Jan. 1939, p. 47.
(Notes on nesting of *Phoenicurus auroreus* in Kangwon Do, where it breeds commonly, frequently building under the eaves of temples and other buildings.)

1939. "Notes on the Specimens of Manchurian Birds chiefly made by Mr. H. Orii in 1935." (In English.)
Tori, **10** (49), Dec. 1939, pp. 446–544.
(Critical systematic notes, embracing several revisions of Korean races from this new material; describes *Cyanopica cyanus koreensis*.)

1941. "A Natural History of the Japanese Birds." (In Japanese.)
Vol. II, large 8vo, Tokyo, 1941, pp. 1–1079, many col. pl. and text figs.
(The second volume of this monumental work, started a decade earlier, carries it through the herons in the Japanese systematic order. Both volumes are well done, and fairly complete, with good descriptions and fine illustrations (done by Mrs. Yamashina). But many important data, such as dates and localities of specimens, are omitted. There is no bibliography, and the synonymy, though accurate as far as it goes, is incomplete.)

YAMASHINA, Y., and MUKASA, K.

1934. "A List of Bird-skins belonging to the Order of *Accipitres* kept in the University Museum of Natural History in Sapporo." (In Japanese.)

Trans. Sapporo Nat. Hist. Soc., **13** (3), 1934, pp. 287–297.
(The only Korean specimen is a Golden Eagle labelled 'Korea, 10 Dec. 1907.)

YOSHIDA, YUJIRO

1923. "The Birds of West Korea in Summer." (In Japanese.)
Tori, **3** (15), July 1923, pp. 314–317.
(A list of 42 species observed on a trip through Hwanghae Do, with a few random comments. Most of the identifications of unmistakable common well-known species are probably accurate, though a few are open to question.)

1925. "Outline of the Revision of Hunting Regulations in Korea." (In Japanese.)
Zool. Mag., **37** (443), 1925, pp. 436–438.

1932. "On Falconry in Korea." (In Japanese.)
Tori, **7** (33/34), May 1932, pp. 340–347.
(An interesting account of this most ancient of sports, with details on catching, training and feeding falcons, how they are used in Korea, and with what results.)

Zoological Magazine. (*Dobutsu-gaku Zasshi.*)
Published in Tokyo; Vol. I (1889) through Vol. 57 (1947); also Transactions and Abstracts, Vols. 1 through 8, 1922 to 1940.
(A complete file has been combed for all Korean ornithological references, which appear in the bibliography under their respective authors.)

PLATE

PLATE

Outline map of Korea to show the provinces.

125°
130°
41°
38°
35°
Hamgyong Pukto
Pyongan Pukto
Hamgyong Namdo
Pyongan Namdo
Hwanghae Do
Kangwon Do
Kyonggi Do
Chungchong Pukto
Chungchong Namdo
Kyongsang Pukto
Cholla Pukto
Kyongsang Namdo
Cholla Namdo

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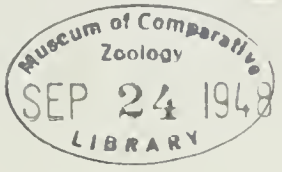

NEW GUINEAN REPTILES AND AMPHIBIANS IN THE MUSEUM OF COMPARATIVE ZOÖLOGY AND UNITED STATES NATIONAL MUSEUM

BY ARTHUR LOVERIDGE

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM
September, 1948

PUBLICATIONS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY AT HARVARD COLLEGE

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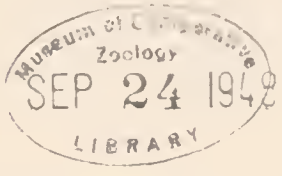

NEW GUINEAN REPTILES AND AMPHIBIANS IN THE MUSEUM OF COMPARATIVE ZOÖLOGY AND UNITED STATES NATIONAL MUSEUM

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No. 2.—New Guinean Reptiles and Amphibians in the Museum of Comparative Zoölogy and United States National Museum

By Arthur Loveridge

CONTENTS

Page

INTRODUCTION
Summary of taxonomic alterations 307
Gazetteer of all New Guinean localities mentioned 309
Acknowledgements 314
List of the reptiles and amphibians of New Guinea with an Index to the species discussed 314
SYSTEMATIC DISCUSSION
Turtles 325
Crocodiles 326
Lizards 327
Snakes 376
Frogs and toads 394
BIBLIOGRAPHY 427

INTRODUCTION

The original intention in writing this report was to make available to herpetologists the data derived from an examination of the many specimens sent in from New Guinea by men in the Services. However, the most assiduous of these collectors, Mr. W. H. Stickel, desired that the whole of his material be included, the greater and most representative selection of which had been presented to the National Museum.

Dr. Doris M. Cochran, curator of the herpetological collections in the Smithsonian Institute, when packing the extensive Stickel material decided to include the rest of their New Guinean specimens. This led to the project being broadened to embrace all material from New Guinea in both museums. In addition reference is made to a few specimens from the adjacent islands of the Aru, Kei, and New Britain Archipelagoes.

Altogether this report deals with the 1,809 specimens in the two museums at the end of 1947. Of these 1,378 were in the Museum of Comparative Zoölogy. It was suggested that keys be compiled for all genera, but though 166 species or races are represented they only form about 44% of the total number listed as occurring in New Guinea.

To compile keys on so slender a representation would inevitably lead to the perpetuation of many errors, for some of the names included in the list will certainly prove to be synonyms.

The largest single collection was that made by W. H. Stickel (631 specimens). Not only did it comprise a great many species, each individual of which was carefully preserved, but with them were the most detailed notes on habits, habitat, and color, ever accompanying a collection submitted to me. It has been possible to print only a portion of these notes in this report, where they appear either in quotes or followed by the collector's initials (W.H.S.). Mr. Stickel has urged me to furnish the names of all regimental colleagues and others who contributed specimens or accompanied him when hunting. Unfortunately this would add too much to the already heavy cost of printing; moreover I am confident that without Stickel's enthusiasm few would have accomplished much in the trying conditions of climate and camp life under which he laboured. One cannot praise too highly Stickel's contribution to New Guinean herpetology, which will undoubtedly be drawn upon by all future writers who attempt to deal exhaustively with the reptiles and amphibians of that fascinating island.

The Museum of Comparative Zoölogy is also much indebted to W. M. Beck who gathered 305 specimens for us at Aitape, a port that under the spelling Etapé has figured as a type locality of some importance. While Stickel, Beck, and others, had to confine their activities to the coast, my colleague Captain P. J. Darlington flew in to Mount Wilhelm in the Bismarck Range from which he returned after a couple of weeks with 224 specimens, among them nine new species or races, including the first *Tropidophorus* ever to be recorded from New Guinea. Dr. Darlington's effort showed that much still remains to be discovered in the interior of New Guinea, whose coastal belt appears to have been relatively well worked from the herpetological point of view.

Prior to World War II the only substantial New Guinean collection in the Museum of Comparative Zoölogy was that made by the late Dr. Thomas Barbour in 1906-1907 (284 specimens) and briefly dealt with in his (1912, pp. 1-203) "Contribution to the Zoögeography of the East Indian Islands." Other sources of specimens referred to in the present paper are: G. H. Bick (1); E. A. Briggs (9); J. F. Cassell (21); L. E. Cheesman (11); D. Crocker (3); S. F. Denton (2); D. Fairchild (1); E. Gerrard (3); W. M. Gordon (1); A. Guilianetti (1); J. E. Hadley (3); E. S. Harald (1); J. Hurter (4); W. G. Iltis (1); L. W. Jarcho (15); P. N. van Kampen (3); — Karcher (1); A. M. Keefe (12); J. Kern (5); G. M. Kohls (4); F. Kopstein (6); R. Mertens (1); C. W. Moren (11);

J. F. G. Nulauf (1); G. H. Penn (35); A. E. Pratt (15); P. T. L. Putnam (43); K. P. Schmidt (2); — Schoede (1); M. A. Smith (1); H. Stevens (38); T. R. Tovell (8); W. M. Welch (3); F. Werner (2); P. Wirz (3).

Material collected by some of the preceding, such as P. Wirz and Miss L. E. Cheesman, were actually received in exchange from other museums, so that the following list of specimens obtained by the Museum of Comparative Zoölogy through exchanges with other institutions does not completely reflect all our additions from these sources. Amsterdam Museum (13); Australian Museum (5); Basel Museum (3); Berlin Museum (20); British Museum (20); Hamburg Museum (1); Leiden Museum (6); Museum Godeffroy (16); Museum Senckenberg (4); Queensland Museum (2); Vienna Museum (2).

SUMMARY OF TAXONOMIC ALTERATIONS

In addition to certain other changes, the following forms are accorded subspecific rank:

Scincus gigas becomes *Tiliqua scincoides gigas* (Schneider)
Lygosoma (*Hinulia*) *jobiensis*, *L.* (*Sphenomorphus*) *variegatum jobiense* Meyer
Hinulia papuensis, *Lygosoma* (*S.*) *megaspila papuense* (Macleay)
Lygosoma kuhnei, *Lygosoma* (*S.*) *striolatum kuhnei* Roux
Lygosoma (*Hinulia*) *maindroni*, *L.* (*S.*) *consobrinum maindroni* Dauvage
Lygosoma moszkowskii, *L.* (*S.*) *pardale moszkowskii* Vogt
Lygosoma wollastoni, *L.* (*Lygosoma*) *pratti wollastoni* Boulenger
Lygosoma neuhaussi, *L.* (*Lygosoma*) *pratti neuhaussi* Vogt
Lygosoma jeudi, *L.* (*Lygosoma*) *pratti jeudi* Boulenger
Leiolopisma morokanum, *L.* (*Leiolopisma*) *stanleyanum morokanum* (Parker)
Heteropus beccarii, *L.* (*Leiolopisma*) *fuscum beccarii* (Peters & Doria)
Heteropus luctuosus, *L.* (*Le.*) *fuscum luctuosum* (Peters & Doria)
Emoa pallidiceps, *Emoia baudinii pallidiceps* de Vis
Mabouia irrorata, *Emoia atrocostata irrorata* (Macleay)
Homalopsis australis, *Cerberus rynchops australis* (Gray)
Pelodryas militarius, *Hyla infrafrenata militaria* (Ramsay)
Rana novae-britanniae, *Rana papua novaebritanniae* Werner
Asterophys minima, *Asterophrys pansa minima* Parker

While the undermentioned are considered to be synonyms, in a few instances additional material may reveal some are recognizable geographic races:

Lygosoma (*Riopa*) *albofasciolatus boettgeri* Sternfeld = *Riopa albofasciolata* (Günther)
Lygosoma misolense Vogt = *L.* (*S.*) *variegatum jobiensis* Meyer

Lygosoma jobiense elegans Sternfeld = *L.* (*S.*) *m. megaspila* (Günther)
Lygosoma amblyplacodes Vogt = *L.* (*S.*) *megaspila papuense* (Macleay)
Lygosoma rufum Boulenger = *L.* (*S.*) *aruensis* (Doria)
Lygosoma (*Leiolopisma*) *papuae* Kinghorn = *L.* (*S.*) *aruensis* (Doria)
Lygosoma (*Hinulia*) *elegantulum* Peters & Doria = *L.* (*S.*) *p. pardale* (Maeleay)
Lygosoma nigrolineatum Boulenger = ? *L.* (*S.*) *p. pardale* (Maeleay)
Lygosoma minuta var. *obtusirostrum* de Jong = *L.* (*S.*) *minutum* Meyer
Lygosoma minuta var. *rotundirostrum* de Jong = *L.* (*S.*) *minutum* Meyer
Lygosoma longicaudatum de Rooij = *L.* (*Ly.*) *solomonis schodei* Vogt
Lygosoma atrigulare Ogilby = *L.* (*Le.*) *fuscum luctuosum* (Peters & Doria)
Lygosoma nigrigulare Boulenger = *L.* (*Le.*) *fuscum luctuosum* (Peters & Doria)
Leiolepisma pullum Barbour = *L.* (*Le.*) *fuscum luctuosum* (Peters & Doria)
Leiolepisma fuscum diguliense Kopstein = *L.* (*Le.*) *fuscum luctuosum* (Peters & Doria)
Lygosoma iridescens Boulenger = *Emoia cyanogaster* (Lesson)
Lygosoma cyanura werneri Vogt = *Emoia caeruleocauda* (de Vis)
Lygosoma werneri triviale Schüz = *Emoia caeruleocauda* (de Vis)
Lygosoma mivarti Boulenger = ? part *Emoia b. baudinii* (Duméril & Bibron)
Lygosoma mehelyi Werner = *Emoia baudinii pallidiceps* de Vis
Lygosoma jakati Kopstein = *Emoia baudinii pallidiceps* de Vis
Lygosoma mivarti var. *obscurum* de Jong = *Emoia baudinii pallidiceps* de Vis
Hyla bernsteini Horst = *Hyla nigropunctata* (Meyer)
Hyla ouwensii Barbour = *Hyla nigropunctata* (Meyer)
Hyla (*Hylella*) *nigromaculata* Barbour = *Hyla nigropunctata* (Meyer)
Hyla atropunctata van Kampen = *Hyla nigropunctata* (Meyer)
Hyla pulchra Wandolleek = ? *Hyla m. montana* Peters & Doria
Hyla mehelyi Nieden = *Hyla pygmaea* (Meyer)
Hyla impura Peters & Doria = *Hyla thesaurensis* Peters
Hyla macros Boulenger = *Hyla thesaurensis* Peters
Hyla megregori Ogilby = *Hyla thesaurensis* Peters
Hyla solomonis Vogt = *Hyla thesaurensis* Peters
Hyla spengleri Boulenger = *Hyla i. infrafrenata* Günther
Cornufer moszkowskii Vogt = *Platymantis corrugatus papuensis* Meyer

In addition to three skinks and five frogs already described from these collections, the following forms are believed to be new:

Lygosoma (*Sphenomorphus*) *variegatum stickeli* subsp. nov.
Lygosoma (*Leiolopisma*) *fuscum jamnanum* subsp. nov.
Cerberus rynchops novaeguineae subsp. nov.
Acanthophis antarcticus rugosus subsp. nov.
Rana grisea milneana subsp. nov.
Asterophrys pansa wilhelmana subsp. nov.
Cophixalus biroi darlingtoni subsp. nov.
Cophixalus variegatus parkeri subsp. nov.

Attention is directed to certain startling or puzzling changes such as the application of *Dasia smaragdina perviridis* Barbour to the New Guinean form. The elucidation of the confusion resulting from Boulenger's application of the name *Lygosoma jobiense* Meyer to the much larger *L. m. megaspila* described by Günther, whose *Hinulia megaspila* Boulenger relegated to the synonymy from which it is now rescued.

In the matter of treating *Sphenomorphus* and *Leiolopisma* as something less than full genera, I have followed Malcolm Smith (1937) as last reviser—though with some misgivings—and I should prefer to regard the groups as subgenera rather than as "sections." However, I have not followed Smith in separating from *Lygosoma* (in its subgeneric sense) the natural group of skinks for which he (1937, p. 222) proposes the name *Ictiscincus*. The fang-like character of the teeth noticeable in some members of the group is so poorly developed in others that I failed to note any appreciable difference between their teeth and those of species he refers to the section *Lygosoma*.

Among the more interesting points that cropped up during these studies, mention might be made of the fact that the overlapping, or failure to overlap, of the adpressed limbs of *Lygosoma* (*Sphenomorphus*) *aruensis* is clearly an age-sex character and of no specific importance. The presence or absence of an interparietal in various species of *Emoia*, regarded as a key character of some importance for over half a century, appears to be without even racial significance.

I should like to stress the need for a re-examination of the types of Macleay and other early Australian workers before the nomenclature of reptiles in this region, including northern Australia, can be satisfactorily stabilized. Many of these early descriptions were much too brief to be properly diagnostic and satisfy the requirements of modern taxonomy.

GAZETEER OF ALL NEW GUINEAN LOCALITIES MENTIONED IN TEXT

When I began work on these collections place names proved a constant source of frustration, for few indeed were to be found in any of the standard atlases. Nor were indices to maps available until my attention was drawn to the United States War Department's loose leaf publication entitled "Gazetteer to Maps of New Guinea." This compilation by the United States Board on Geographical Names proved an inestimable boon on which I have drawn heavily in preparing the fol-

lowing list of herpetological localities. It is hoped that the list will supply a much-felt need for those colleagues to whom the Army Map Service's publication is inaccessible.

In an effort to standardize the many diverse renderings, I have adopted the spelling employed in the Army publication except in the case of Jappen Island, for which the name Jobi has so long been in use in herpetological literature. Another of Meyer's 1874 type localities is that of Mysore (Misore or Misory) Island. This I have changed to Biak (alias Wiak) Island on the authority of Dr. Robert Mertens who investigated the matter in connection with one of the monitor lizards described from there by Meyer. Unlike Jobi, Mysore no longer appears on modern maps and, moreover, is likely to be confused with the not so distant Mysol (or Misool) Island lying between northwest New Guinea and the Moluccas.

In the present paper a number of type localities have been restricted where their vagueness seems likely to lead to taxonomic confusion, otherwise such action has been left to first revisers.

Latitude & Longitude[1]		New Guinean Localities mentioned these pages
10°20′ S., 150°40′ E.	B.	Ahioma
3°10′ S., 142°25′ E.	A.	Aitape (Etape)
	D.	Albatrosbivak, Mamberamo River; which see
7°25′ S., 145°50′ E.	B.	Albert Edward Mountains
0°20′ S., 132°10′ E.	D.	Amsterdam Island off Cape Sansapor
0°55′ S., 134°00′ E.	D.	Andai
1°20′ S., 133°55′ E.	D.	Angi (Anzi or Anggi Gigi) Lakes
1°45′ S., 135°50′ E.	D.	Ansoes (Ansus; not Ansoes Id.), Jobi Island
1°05′ S., 136°15′ E.	D.	Arfak Mountains
	D.	Assike, Upper Digoel River; which see
5°25′ S., 145°50′ E.	A.	Astrolabe Bay
	D.	Bajon, Waigeo Island; which see
1°00′ S., 136°00′ E.	D.	Biak (Misory) Island, Schouten Islands
9°00′ S., 143°00′ E.	D.	Binaturi River
5°25′ S., 144°40′ E.	A.	Bismarck Range
	D.	Bivak Island, Lorentz River; which see
5°25′ S., 145°45′ E.	A.	Bogadjim, Astrolabe Bay
5°30′ S., 145°50′ E.	A.	Bongu, Astrolabe Bay
	A.	Bulowat, Morobe District; which see
8°40′ S., 148°25′ E.	A.	Buna
2°30′ S., 140°30′ E.	D.	Cijcloop (Cyclops) Mountains
	D.	Cyclops, i.e. Cijcloop Mountains; which see

[1]A = Australian New Guinea, B = British, D = Dutch.

5°35′ S., 140°15′ E.	D.	Digoel (Digul) River
	D.	Digul, i.e. Digoel River; which see
	B.	Dinawa, Owen Stanley Mountains; which see
	D.	Djamna, i.e. Jamna Island; which see
8°50′ S., 148°20′ E.	A.	Dobodura
1°40′ S., 136°10′ E.	D.	Dore (Dorerey; Dore Harbor) Jobi Island Mertens places it on Beron Islet.
	A.	Draeger Harbor, 5 miles east of Finschhafen
	B.	Epa, i.e. Mount Epa; which see
5°25′ S., 145°45′ E.	A.	Erima, Astrolabe Bay
3°55′ S., 134°50′ E.	D.	Etna Bay
2°55′ S., 132°15′ E.	D.	Fakfak
9°35′ S., 150°45′ E.	B.	Ferguson (Fergusson or Moratau) Island
6°30′ S., 147°50′ E.	A.	Finschhafen (Finsch-Hafen), Huon Gulf
8°30′ S., 143°30′ E.	B.	Fly River; also runs through Dutch New Guinea
	D.	Fort Merkusoord, west coast Dutch New Guinea
	A.	Friederich-Wilhelmshafen = Madang; which see
	B.	Gamadodo, Milne Bay; which see
2°30′ S., 135°25′ E.	D.	Geelvink Bay
	D.	Geitenkamp, near Lorentz River; which see
	?	Germania Bay ? Humboldt Bay; which see
6°25′ S., 147°50′ E.	A.	Gusiko, Huon Peninsula
	D.	Haas
8°50′ S., 146°35′ E.	B.	Hall Sound
	D.	Hatam, Arfak Mountains; which see
	B.	Haveri in Moroka, Bartholomew Range
4°30′ S., 138°40′ E.	D.	Hellwig Mountains
2°30′ S., 140°45′ E.	D.	Hollandia, Humboldt Bay
2°35′ S., 140°45′ E.	D.	Humboldt Bay
	A.	Ibundo, Sepik River; which see
8°35′ S., 146°35′ E.	B.	Inawi, Mekeo District
2°15′ S., 134°00′ E.	D.	Jakati
2°00′ S., 133°55′ E.	D.	Jakati River, Bintuni (Bentoni) Bay
2°00′ S., 139°15′ E.	D.	Jamna (Djamna) Island, Geelvink Bay
2°20′ S., 134°30′ E.	D.	Jende (Jendee), Roon Island, Geelvink Bay
1°45′ S., 136°25′ E.	D.	Jobi (or Japen; Jappen) Island, Geelvink Bay
	A.	Kaiserin Augusta River = Sepik River; which see
	A.	Kaiserwilhelmsland = Australian New Guinea
	A.	Kalueng River; see Gusiko, Huon Peninsula
	D.	Kapaor = Kapar; which see
0°55′ S., 132°40′ E.	D.	Kapar
	D.	Kasawari, Kohari Mountains; which see
	D.	Katau, i.e. Binaturi River; which see
	D.	Katow, i.e. Binaturi River; which see
8°35′ S., 151°10′ E.	B.	Kiriwina Island

8°55′ S., 147°25′ E.	B.	Kito River
2°50′ S., 141°05′ E.	D.	Kohari Mountains, south of Humboldt Bay
8°55′ S., 147°50′ E.	B.	Kokoda
	A.	Koragu, Sepik River; which see
	D.	Kordo, Mysore = Biak Island; which see
	A.	Kundiawa, Chimbu Valley
	B.	Kwatto Branch Mission, Milne Bay; which see
	A.	Lababia, Huon Gulf
2°35′ S., 140°30′ E.	D.	Lake Sentani
6°35′ S., 147°50′ E.	A.	Langemak Bay
	D.	Launch Camp, Setekwa River; which see
1°35′ S., 138°45′ E.	D.	Liki Island, north of Sarmi Island
5°05′ S., 138°40′ E.	D.	Lorentz (or North) River
5°15′ S., 145°50′ E.	A.	Madang
	D.	Mafoor Island (an Adolf B. Meyer loc. 1874)
8°33′ S., 147°00′ E.	B.	Mafulu, 4,000 feet
0°15′ S., 130°50′ E.	D.	Majalibit Bay, Waigeo Island
1°35′ S., 137°55′ E.	D.	Mamberamo River
	D.	Manikion District
	D.	Manisam Island
0°50′ S., 134°05′ E.	D.	Manokwari
3°20′ S., 143°00′ E.	A.	Matapan, Wakip River
8°32′ S., 140°20′ E.	D.	Merauke
10°20′ S., 150°30′ E.	B.	Milne Bay (Tauwarra Bay), Eastern Division
4°20′ S., 136°40′ E.	D.	Mimika River
1°15′ S., 136°20′ E.	D.	Mios Woendi (Meosboendi) off Biak Island
10°40′ S., 152°45′ E.	B.	Misima (St. Aignan) Island
		Modderlust (Modder-lust)
	B.	Mondo, 9 miles southeast of Mafulu; which see
	B.	Moresby, see Port Moresby
	A.	Morobe District
	B.	Moroka, 2,300 feet, Bartholomew Mountains
	D.	Moso = Mosso River; which see
2°40′ S., 140°55′ E.	D.	Mosso River empties into Humboldt Bay
8°45′ S., 146°45′ E.	B.	Mount Epa
	D.	Mount Lamantsiri, Lobo, Triton Bay; which see
9°00′ S., 148°05′ E.	B.	Mount Lamington
7°10′ S., 146°40′ E.	A.	Mount Misim, Morobe District
8°40′ S., 147°30′ E.	B.	Mount Scratchley, Owen Stanley Mountains
	B.	Mount Tafa, 5 miles southeast of Mondo
8°50′ S., 147°35′ E.	B.	Mount Victoria, Owen Stanley Range
5°45′ S., 145°00′ E.	A.	Mount Wilhelm, Bismarck Range
1°50′ S., 130°10′ E.		Mysol = Misool Island, Molucca Islands
	D.	Mysore = Biak (Misory) Island; which see
	B.	Nieura = Nikora; which see

8°50′ S., 146°35′ E.	B.	Nikora, opposite Yule Island
	D.	North River = Lorentz River; which see
9°10′ S., 147°50′ E.	B.	Owen Stanley Mountains
1°15′ S., 136°15′ E.	D.	Owi Island, Padaido Islands
1°15′ S., 136°30′ E.	D.	Padaido (Padaidori; Padeaido) Islands
	D.	Parana Valley (a P. Wirz loc. 1922)
1°15′ S., 136°35′ E.	D.	"Passim" ? Pasi Island, Geelvink Bay
	D.	Pionierbivak, Mamberamo River; which see
1°40′ S., 135°45′ E.	D.	Pom, Jobi Island, Geelvink Bay
9°25′ S., 147°15′ E.	B.	Port Moresby
	D.	Rawack Island, north of Waigeo Id., which see
4°35′ S., 138°45′ E.	D.	Resi Mountains
	A.	Rienjamur, Torricelli Mountains; which see
2°25′ S., 134°35′ E.	D.	Roon (Ron; Run) Island, Geelvink Bay
4°45′ S., 138°50′ E.	D.	Sabang, Lorentz River
	A.	Sacksackhütte, Torricelli Mtns.; which see
5°40′ S., 146°30′ E.	A.	Saidor
	B.	Saint Aignan Island = Misima Id.; which see
	B.	Saint John's River
8°55′ S., 147°25′ E.	B.	Saint Joseph's River (if Creek = Kito)
1°05′ S., 130°55′ E.	D.	Salawati (Salwatti) Island
	D.	Sansapor
	D.	Saonek, Waigeo Island; which see
6°30′ S., 147°45′ E.	A.	Satelberg (Sattelberg), Huon Peninsula
3°10′ S., 142°30′ E.	A.	Seleo Island, near Aitape (Berlinhafen)
4°00′ S., 144°25′ E.	A.	Sepik River (mouth near Cape Girgir)
2°00′ S., 140°00′ E.	D.	Sermowai River (mouth west of Hollandia)
4°40′ S., 137°20′ E.	D.	Setekwa River
7°50′ S., 143°45′ E.	B.	Sogeri (Sogere) Camp at 1,750 feet
0°55′ S., 131°15′ E.	D.	Sorong
	B.	Sudest Island = Tagula Island; which see
5°50′ S., 141°40′ E.	A.	Surprise Creek
11°30′ S., 153°25′ E.	B.	Tagula Island
2°40′ S., 140°55′ E.	D.	Tami River (mouth in Humboldt Bay)
	A.	Tonomanbanau, Bismarck Mountains; which see
2°22′ S., 139°48′ E.	D.	Tawarin River (somewhat below position given)
	D.	Timena River, south shore of Lake Sentani; see
2°00′ S., 139°00′ E.	D.	Toem, Maffin Bay
3°20′ S., 142°30′ E.	A.	Torricelli Mountains
2°00′ S., 139°00′ E.	D.	Tor River near Toem, Maffin Bay (Not B. N. G.)
3°50′ S., 134°00′ E.	D.	Triton Bay
8°30 S., 151°05 E.	B.	Trobriand — Kiriwina Islands
	B.	Upuli
	D.	Utakwa River = Setekwa River; which see
	A.	Valise Island = Walif Island; which see

0°10 S., 130°35 E.	D.	Waigeo (Waigeu; Waigiu) Island
4°25 S., 135°55 E.	D.	Wakia River
3°15 S., 143°20 E.	A.	Walif (Valise) Island, east of Aitape
8°00 S., 141°00 E.	D.	Wanggar River, Weyland Mountains
1°20 S., 131°05 E.	D.	Wasemsan (Wa Samson) River, near Salwati
7°20 S., 146°45 E.	A.	Wau
	D.	Wendessi
	D.	Went Mountains
	D.	Wiak Island = Biak Island; which see
4°25′ S., 138°40′ E.	D.	Wichman Mountains
1°40′ S., 135°30′ E.	D.	Wooi Bay, Jobi (Japen) Island
8°50′ S., 146°30′ E.	B.	Yule Island

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A LIST OF THE REPTILES AND AMPHIBIANS OF NEW GUINEA

Note. Including some from New Britain, Aru and Kei Islands. Families and genera are systematically arranged, species and subspecies alphabetically. Those mentioned in this paper are marked with an asterisk (*); the listing of others does not necessarily imply their occurrence in New Guinea is certain, or recognition of their validity. Some recently proposed names do not appear as they are considered synonyms. A few extraterritorial names are included in parentheses.

CLASS REPTILIA

TESTUDINATA[1]

DERMOCHELIDAE

PAGE

Dermochelys coriacea (Linné)

CHELONIIDAE

**Lepidochelys olivacea* (Eschscholtz) 325
Caretta caretta (Linné)
Chelonia mydas (Linné)
**Eretmochelys imbricata* (Linné) 325

CHELYDIDAE

Emydura albertisi Boulenger
Emydura branderhorsti Ouwens
Emydura krefftii (Gray)
Emydura macquarri (Gray)
**Emydura novaeguineae* Meyer 326
Emydura schultzei Vogt
Emydura subglobosa (Krefft)
Chelodina novaeguineae Boulenger
Chelodina oblonga Gray
Chelodina siebenrocki Werner

CARETTOCHELYIDAE

**Carettochelys insculpta* Ramsay 326

TRIONYCHIDAE

Pelochelys bibroni Owen

LORICATA

CROCODYLIDAE

**Crocodylus novaeguineae* Schmidt 326
Crocodylus porosus Schneider

[1] The allegedly New Guinean snapping turtle (*Devisia mythodes*) has been shown by Shreve and Loveridge (1947, Copeia, p. 120) to be only a North American *Chelydra serpentina* (Linné) with wrong locality data.

SAURIA[1]

GEKKONIDAE

PAGE

**Gymnodactylus loriae* Boulenger 329
**Gymnodactylus louisadensis* de Vis 329
Gymnodactylus marmoratus (Kuhl)
Gymnodactylus mimikanus Boulenger
Gymnodactylus novaeguineae Schlegel
**Gymnodactylus papuensis* Brongersma 328
**Gymnodactylus pelagicus* (Girard) 327
Gymnodactylus sermowaiensis Rooij
**Gymnodactylus vankampeni* Brongersma 327
**Hemidactylus frenatus* Duméril & Bibron 330
**Hemidactylus garnotii* Duméril & Bibron 331
**Cosymbotus platyurus* (Schneider) 331
**Gehyra baliola* (A. Duméril) 332
**Gehyra interstitialis* Oudemans 332
Gehyra lampei Andersson
**Gehyra mutilata* (Wiegmann) 332
**Gehyra oceanica* (Lesson) 333
Gehyra variegata (Duméril & Bibron)
Gehyra vorax Girard
**Hemiphyllodactylus typus typus* (Bleeker) 333
Lepidodactylus guppyi Boulenger
**Lepidodactlus lugubris* (Duméril & Bibron) 333
**Lepidodactylus pulcher* Boulenger 334
Lepidodactylus woodfordi Boulenger
Gekko pumilus Boulenger
**Gekko vittatus* Houttuyn 335

AGAMIDAE

Goniocephalus auritus Meyer
Goniocephalus binotatus Meyer
Goniocephalus bruijnii Peters & Doria
**Goniocephalus dilophus* (Duméril & Bibron) 336
Goniocephalus geelvinkianus Peters & Doria
**Goniocephalus godeffroyi* (Peters) 336
**Goniocephalus modestus* Meyer 337
Goniocephalus nigrigularis Meyer

[1] Omitted from this list are *Calotes cristatellus* (Kuhl), *Draco lineatus* Daudin and *Varanus timorensis* (Gray), whose inclusion by De Jong (1915, pp. 296, 299) appears inadmissable.

PAGE
Goniocephalus papuensis (Macleay) 336
Diporiphora australis (Steindachner)
Diporiphora bilineata Gray
Physignathus lesueueri Gray
**Physignathus temporalis* Günther 337
Chlamydosaurus kingi Gray
Hydrosaurus amboinensis amboinensis (Schlosser)

SCINCIDAE
**Tribolonotus novaeguineae* (Schlegel) 338
**Tribolonotus gracilis* Rooij 338
**Tropidophorus darlingtoni* Loveridge 338
**Tiliqua scincoides gigas* (Schneider) 339
**Mabuya multifasciata multifasciata* (Kuhl) 339
Dasia 339
**Dasia smaragdina perviridis* Barbour 340
**Riopa albofasciata* (Günther) 342
**Riopa rufescens* (Shaw) 341
Lygosoma (Sphenomorphus) aignanum Boulenger
Lygosoma (Sphenomorphus) albodorsale Vogt
Lygosoma (Sphenomorphus) annectens Boulenger
Lygosoma (Sphenomorphus) aruanum Roux
**Lygosoma (Sphenomorphus) aruense* (Doria) 348
**Lygosoma (Sphenomorphus) consobrinum maindroni* Sauvage . . 350
Lygosoma (Sphenomorphus) derooyae Jong
Lygosoma (Sphenomorphus) emigrans Jeude
Lygosoma (Sphenomorphus) granulatum Boulenger
Lygosoma (Sphenomorphus) lesueuri Duméril & Bibron
Lygosoma (Sphenomorphus) louisadense Boulenger
**Lygosoma (Sphenomorphus) megaspila megaspila* (Günther) . . . 345
**Lygosoma (Sphenomorphus) megaspila papuense* (Macleay) . . 346
Lygosoma (Sphenomorphus) melanochlorum Vogt
**Lygosoma (Sphenomorphus) melanopogon* Dumöril & Bibron . . 348
Lygosoma (Sphenomorphus) mimikanum Boulenger
**Lygosoma (Sphenomorphus) minutum* Meyer 351
Lygosoma (Sphenomorphus) nototaenia Boulenger
**Lygosoma (Sphenomorphus) pardale pardale* (Macleay) 350
**Lygosoma (Sphenomorphus) pardale moszkowskii* Vogt 350
Lygosoma (Sphenomorphus) rufum Boulenger
Lygosoma (Sphenomorphus) schultzei Vogt
Lygosoma (Sphenomorphus) simum Sauvage

PAGE

Lygosoma (*Sphenomorphus*) *spaldingi* (Macleay)
**Lygosoma* (*Sphenomorphus*) *striolatum kohnci* Roux 348
Lygosoma (*Sphenomorphus*) *totocarinatum* Vogt
Lygosoma (*Sphenomorphus*) *undulatum* Peters & Doria
[**Lygosoma* (*Sphenomorphus*) *variegatum variegatum* Peters] . . . 343
**Lygosoma* (*Sphenomorphus*) *variegatum jobiense* Meyer 344
**Lygosoma* (*Sphenomorphus*) *variegatum stickeli* subsp. nov. 345
Lygosoma (*Lygosoma*) *beauforti* Jong
Lygosoma (*Lygosoma*) *comtum* Roux
Lygosoma (*Lygosoma*) *crassicauda* A. Duméril
Lygosoma (*Lygosoma*) *forbesii* Boulenger
Lygosoma (*Lygosoma*) *keiense* Kopstein
Lygosoma (*Lygosoma*) *loriae* Boulenger
Lygosoma (*Lygosoma*) *mülleri mülleri* (Schlegel)
Lygosoma (*Lygosoma*) *mülleri latifasciatum* Meyer
Lygosoma (*Lygosoma*) *nigriventre* Rooij
Lygosoma (*Lygosoma*) *oligolepis* Boulenger
**Lygosoma* (*Lygosoma*) *pratti pratti* Boulenger 352
Lygosoma (*Lygosoma*) *pratti jeudi* Boulenger
Lygosoma (*Lygosoma*) *pratti neuhaussi* Vogt
**Lygosoma* (*Lygosoma*) *pratti wollastoni* Boulenger 352
Lygosoma (*Lygosoma*) *solomonis solomonis* Boulenger
**Lygosoma* (*Lygosoma*) *solomonis schodei* Vogt 353
Lygosoma (*Lygosoma*) *torneri* Vogt
Lygosoma (*Lygosoma*) *unilineatum* Rooij
**Lygosoma* (*Leiolopisma*) *bicarinatum* (Macleay) 365
Lygosoma (*Leiolopisma*) *cheesmanae* Parker
Lygosoma (*Leiolopisma*) *elegantoides elegantoides* Ahl
**Lygosoma* (*Leiolopisma*) *elegantoides lobulus* Loveridge 355
**Lygosoma* (*Leiolopisma*) *flavipes* Parker 354
**Lygosoma* (*Leiolopisma*) *fuscum fuscum* (Duméril & Bibron) . . 361
**Lygosoma* (*Leiolopisma*) *fuscum beccarii* (Peters & Doria) 360
**Lygosoma* (*Leiolopisma*) *fuscum jamnanum* subsp. nov. 363
**Lygosoma* (*Leiolopisma*) *fuscum luctuosum* (Peters & Doria) . . 361
**Lygosoma* (*Leiolopisma*) *longiceps* Boulenger 357
**Lygosoma* (*Leiolopisma*) *miotis* Boulenger 359
**Lygosoma* (*Leiolopisma*) *noctua noctua* (Lesson) 357
Lygosoma (*Leiolopisma*) *noctua rouxi* Hediger
**Lygosoma* (*Leiolopisma*) *novaeguineae* Meyer 365
Lygosoma (*Leiolopisma*) *parkeri* M. A. Smith
Lygosoma (*Leiolopisma*) *phaeodes* Vogt

PAGE
Lygosoma (Leiolopisma) prehensicauda Loveridge 355
Lygosoma (Leiolopisma) pulchrum Boulenger 358
Lygosoma (Leiolopisma) semoni Oudemans 356
Lygosoma (Leiolopisma) stanleyanum stanleyanum Boulenger. 358
Lygosoma (Leiolopisma) stanleyanum morokanum Parker 359
Lygosoma (Leiolopisma) virens virens (Peters) 355
Emoia 366
Emoia acrocarinata Kopstein
Emoia ahli Vogt
Emoia atrocostata irrorata (Macleay) 372
Emoia atrocostata nigra (Hombron & Jacquinot)
Emoia baudinii baudinii (Duméril & Bibron) 369
Emoia baudinii pallidiceps de Vis 370
Emoia buergersi Vogt
Emoia callisticta (Peters & Doria)
Emoia cuneiceps (de Vis)
Emoia cyanogaster (Lesson) 366
Emoia cyanura (Lesson) 367
Emoia caeruleocauda (de Vis) 368
Emoia klossi Boulenger
Emoia tetrataenia Boulenger
Emoia tropidolepis Boulenger 372
Ablepharus boutonii keiensis Roux 374
Ablepharus boutonii novaeguineae (Mertens) 373
Ablepharus boutonii pallidus (Mertens)

DIBAMIDAE

Dibamus novaeguineae Duméril & Bibron

PYGOPODIDAE

Lialis burtonis Gray
Lialis jicari Boulenger 374

VARANIDAE

Varanus gouldi (Gray)
Varanus indicus indicus (Daudin) 374
Varanus indicus kalabeck (Lesson)
Varanus prasinus prasinus (Schlegel)
Varanus prasinus beccarii (Doria) 375
Varanus salvadorii (Peters & Doria)

SERPENTES

TYPHLOPIDAE

PAGE

Typhlops ater suturalis Brongersma
Typhlops bipartitus Sauvage
Typhlops depressiceps Sternfeld
**Typhlops erycinus* Werner 376
Typhlops flaviventer Peters
Typhlops fusconotus Brongersma
Typhlops inornatus Boulenger
Typhlops iridescens Jong
Typhlops leucoproctus Boulenger
Typhlops monochrous Vogt
Typhlops multilineatus Schlegel
Typhlops polygrammicus polygrammicus Schlegel
Typhlops similis Brongersma
Typhlops supranasalis Brongersma

BOIDAE

**Bothrochilus boa* (Schlegel) 376
**Liasis amethistinus amethistinus* (Schneider) 377
Liasis fuscus fuscus Peters
**Liasis fuscus albertisi* Peters & Doria 377
Liasis maximus Werner
Liasis olivaceus papuensis Peters & Doria
Morelia argus (Linné)
**Chondropython viridis* (Schlegel) 378
**Enygrus asper asper* (Günther) 378
**Enygrus asper schmidti* Stull 379
**Enygrus carinatus* (Schneider) 379

ANILIIDAE

Cylindrophis arucusis Boulenger

COLUBRIDAE

**Acrochordus granulatus granulatus* (Schneider) 380
**Natrix doriae* (Boulenger) 381
Natrix hypomelas Günther
**Natrix mairii multiscutellata* Brongersma 381
**Natrix melanocephala* (Werner) 381

PAGE

Natrix montana Jeude
Natrix novaeguineae Jeude
Natrix picturata Schlegel
**Stegonotus dichli* Lindholm 383
Stegonotus dorsalis Werner
**Stegonotus guentheri* Boulenger 383
**Stegonotus magnus* (Meyer) 382
**Stegonotus modestus* (Schlegel) 382
Stegonotus pocchi Werner
Stegonotus plumbeus (Macleay)
Ahaetulla calligaster calligaster (Günther)
Ahaetulla calligaster distinguendus Meise & Hennig
Ahaetulla calligaster keiensis Mertens
Ahaetulla calligaster papuensis (Boulenger)
**Ahaetulla calligaster salomonis* (Günther) 386
**Ahaetulla calligaster schlenckeri* (Macleay) 385
Ahaetulla meeki (Boulenger)
**Ahaetulla punctulata lineolata* (Jacques & Guichenot) 384
**Boiga irregularis irregularis* (Merrem) 387
Brachyorrhus albus (Linné)
Enhydris enhydris (Schneider)
Enhydris polylepis Fischer
**Fordonia leucobalia* (Schlegel) 388
**Cerberus rynchops novaeguineae* subsp. nov. 388
**Myron richardsonii* Gray 389
Cantoria annulata Jong
Hemirnia ventromaculata Jong

ELAPIDAE

Glyphodon tristis Günther
Toxicocalamus stanleyanus Boulenger
Ultrocalamus preussi preussi Sternfeld
Ultrocalamus preussi angusticinctus Bogert & Matalas
Apistocalamus granidis Boulenger
Apistocalamus lamingtoni Kinghorn
Apistocalamus lönnbergi Boulenger
Apistocalamus loriae Boulenger
Apistocalamus pratti Boulenger
Pseudapistocalamus nymani Lönnberg
**Aspidomorphus mülleri mülleri* (Schlegel) 390

PAGE

Aspidomorphus mülleri interruptus Brongersma
Aspidomorphus mülleri lineaticollis (Werner)
Aspidomorphus mülleri lineatus Brongersma
**Aspidomorphus schlegelii* (Günther) 390
**Pseudechis australis australis* (Gray) 391
Pseudechis papuanus Peters & Doria
Pseudechis scutellatus Peters
**Micropechis ikaheka ikaheka* (Lesson) 391
**Micropechis ikaheka fasciatus* Fischer 391
**Acanthophis antarcticus antarcticus* (Shaw) 392
**Acanthophis antarcticus rugosus* subsp. nov. 392

HYDROPHIIDAE

**Laticauda colubrina* (Schneider) 393
**Laticauda laticaudata* (Linné) 393
Laticauda schistorhynchus (Günther)
Aipysurus duboisii Bavay
Aipysurus eydouxi (Gray)
Aipysurus laevis Lacépede
Enhydrina schistosa (Daudin)
Hydrophis belcheri (Gray)
Hydrophis elegans (Gray)
**Hydrophis fasciatus atriceps* Günther 393
Hydrophis mertoni (Roux)
Hydrophis ornatus ornatus (Gray)
Hydrophis ornatus ocellatus Gray
Lapemis hardwickii Gray
Pelamis platurus (Linné)

CLASS AMPHIBIA

SALIENTIA

LEPTODACTYLIDAE

Lechriodus fletcheri (Boulenger)
Lechriodus melanopyga (Doria)
Lechriodus papuanus (Roux)
Lechriodus platyceps Parker
Limnodynastes convexiusculus (Macleay)
Crinia signifera signifera (Girard)

HYLIDAE PAGE

Hyla albolabris Wandolleck
Hyla angiana Boulenger
**Hyla angularis* Loveridge 402
**Hyla arfakiana* Peters & Doria 398
**Hyla becki* Loveridge 405
**Hyla bicolor* (Gray) 399
Hyla brachypus (Werner)
**Hyla brongersmai* Loveridge 399
**Hyla caerulea* (Shaw) 404
Hyla chloronota (Boulenger)
**Hyla congenita* Peters & Doria 405
**Hyla darlingtoni* Loveridge 396
Hyla eucnemis Lönnberg
Hyla genimaculata Horst
**Hyla graminea* Boulenger 394
Hyla humeralis Boulenger
**Hyla infrafrenata infrafrenata* Günther 402
**Hyla infrafrenata militaria* (Ramsay) 404
Hyla jeudi Werner
Hyla longicrus (Boulenger)
**Hyla montana montana* Peters & Doria 396
**Hyla montana pratti* Boulenger 397
Hyla nasuta (Gray)
**Hyla nigropunctata* (Meyer) 394
Hyla obsoleta Lönnberg
Hyla obtusirostris (Meyer)
Hyla papuensis Werner
**Hyla pygmaea* (Meyer) 397
Hyla rhacophorus van Kampen
Hyla sanguinolenta van Kampen
**Hyla thesaurensis* Peters 400
Hyla vagabunda Peters & Doria
Hyla wirzi Roux
Hyla wollastoni Boulenger
Hyla wolterstorffi (Werner)
Nyctimystes granti Boulenger
Nyctimystes gularis Parker
**Nyctimystes milneana* Loveridge 406
**Nyctimystes montana* Parker 406
**Nyctimystes papua* (Boulenger) 405
Nyctimystes semipalmata Parker

RANIDAE PAGE

Cornufer unicolor Tschudi (part)
**Platymantis beauforti* (van Kampen) 410
**Platymantis boulengeri* (Boettger) 410
**Platymantis cheesmanae* Parker 409
*[*Platymantis corrugatus corrugatus* (A. Duméril)] 406
**Platymantis corrugatus papuensis* Meyer 407
**Platymantis corrugatus rubrostriatus* (Barbour) 409
Platymantis punctatus Peters & Doria
**Rana arfaki* van Kampen 415
**Rana daemeli* (Steindachner) 410
**Rana grisea grisea* van Kampen 413
**Rana grisea milneana* subsp. nov. 414
Rana grunniens Daudin (part)
Rana kreffti Boulenger
**Rana papua papua* Lesson 412
**Rana papua novaebritanniae* Werner 412

BREVICIPITIDAE or MICROHYLIDAE

**Genyophryne thomsoni* Boulenger 416
Xenobatrachus bidens (van Kampen)
Xenobatrachus giganteus (van Kampen)
Xenobatrachus macrops (van Kampen)
Xenobatrachus ocellatus (van Kampen)
Xenobatrachus ophiodon Peters & Doria
**Xenobatrachus rostratus* (Méhely) 416
Asterophrys bouwensi (de Witte)
Asterophrys doriae (Boulenger)
Asterophrys microtis (Werner)
**Asterophrys oxycephala* (Schlegel) 419
**Asterophrys pansa pansa* (Fry) 417
Asterophrys pansa minima Parker
**Asterophrys pansa wilhelmana* subsp. nov. 419
**Asterophrys robusta* (Boulenger) 417
**Asterophrys rufescens* (Macleay) 416
Asterophrys turpicola (S. Müller)
**Asterophrys valvifera* (Barbour) 417
**Metopostira ocellata* Mehely 420
Baragenys atra (Günther)
**Baragenys cheesmanae* Parker 420

PAGE
Baragenys kopsteini (Mertens)
**Sphenophryne brevicrus* (van Kampen) 422
Sphenophryne brevipes (Boulenger)
**Sphenophryne cornuta* Peters & Doria 420
**Sphenophryne macrorhyncha* (van Kampen) 421
Sphenophryne mehelyi Parker
Sphenophryne rhododactyla (Boulenger)
**Sphenophryne schlaginhaufeni* Wandolleck 421
Oreophryne albopunctata (van Kampen)
**Oreophryne anthonyi* (Boulenger) 422
**Oreophryne biroi* (Méhely) 423
Oreophryne crucifera (van Kampen)
Oreophryne flava Parker
Oreophryne kampeni Parker
Cophixalus ateles (Boulenger)
Cophixalus biroi biroi (Méhely)
**Cophixalus biroi darlingtoni* subsp. nov. 423
Cophixalus cheesmanae Parker
**Cophixalus geislerorum* Boettger 423
Cophixalus montanus (Boettger)
**Cophixalus oxyrhinus* (Boulenger) 426
Cophixalus rostellifer (Wandolleck)
**Cophixalus variegatus variegatus* (van Kampen) 425
**Cophixalus variegatus parkeri* subsp. nov. 425
**Cophixalus verrucosus* (Boulenger) 424

TESTUDINATA

CHELONIIDAE

Lepidochelys olivacea (Eschscholtz)

Chelonia olivacea Eschscholtz, 1829, Zool. Atlas, Part 1, p. 3, pl. iii: Manila Bay, Philippine Islands.

1 (M. C. Z. 4716) New Britain Archipelago (Mus. Godeffroy) 1882.

Eretmochelys imbricata (Linné)

Testudo imbricata Linné, 1766, Syst. Nat. (ed. 12), **1**, p. 350: American and Asiatic Seas.

Eretmochelys squamata Agassiz, 1857, Contr. Nat. Hist. U. S., **1**, p. 382: Indian and Pacific Oceans.

1 alc. (M. C. Z. 4715) New Britain Arch. (Mus. Godeffroy) 1882.
2 shells (M. C. Z. 46547–8) Mios Woendi, D. N. G. (T. Barbour) 1907.
3 crania (M. C. Z. 49450) Liki Id., D. N. G. (W. H. Stickel) 1944.

CHELYDIDAE

Emydura novaeguineae Meyer

Platemys Novae Guineae Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 128: (Dutch) New Guinea.

1 (M. C. Z. 28640) Wanggar River, D. N. G. (British Mus.) 1929.

The closely related *schultzei* Vogt (1911, p. 410) is differentiated in Rooij's key (1915, p. 318) by the tail being longer than the head, possibly a sexual difference. In our specimen the head is 41 mm. long, the carapace 185 mm., and the tail 21 mm.

CARETTOCHELYIDAE

Carettochelys insculpta Ramsay

Carettochelys insculpta Ramsay, 1886, Proc. Linn. Soc. N. S. W. (2), **1**, p. 158, pls. iii–iv: Fly River, British New Guinea.

1 (M. C. Z. 20964) Lorentz River, D. N. G. (Amsterdam Mus.) 1925.

One of H. A. Lorentz's specimens with a carapace length of just over 400 mm. (16 inches).

LORICATA

CROCODYLIDAE

Crocodylus novaeguineae Schmidt

Crocodylus novae-guineae Schmidt, 1928, Field Mus. Nat. Hist. Zool. Series, **12**, p. 177, pls. xiii–xiv: Ibundo, lower Sepik River, Australian New Guinea.

2 skulls (M. C. Z. 32099–100) Near Sepik River, A. N. G. (K. P. Schmidt) 1931.

These specimens, obtained above Koragu, have been discussed by Schmidt (1932, pp. 167–172) in a paper dealing with the validity of a species whose interesting habits have been reported on at length by W. T. Neill, Jr. (1946, p. 17).

SAURIA

GEKKONIDAE

Gymnodactylus vankampeni Brongersma

Gymnodactylus vankampeni Brongersma, 1933, Ann. Mag. Nat. Hist. (10), **11**, p. 252: near Modderlust, Dutch New Guinea.

♀ (M. C. Z. 48567) Aitape, A. N. G. (W. M. Beck) 1944.

Internasals in contact; supra- and postnasals 2; upper labials 6; postmentals 0; dorsal tubercles in 10 rows; lamellae under fourth toe 17; preanal pores 46; no preanal groove; no lateral fold. Total length of ♂, 59 (29 + 30) mm., but tail regenerated.

This distinctive dwarf species, which superficially resembles *G. pelagicus* very closely, was taken with fifteen *pelagicus* at Aitape on the north coast about a hundred miles east of Modderlust.

Gymnodactylus pelagicus (Girard)

Heteronota pelagica Girard, 1857, Proc. Acad. Nat. Sci. Philadelphia, p. 197: Fiji and Navigator Islands.

Heteronota fasciata Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 100: Hall Sound, British New Guinea.

Gymnodactylus heteronotus Boulenger, 1885, Cat. Lizards Brit. Mus., **1**, p. 41: *nom. nov.* for *fasciata* Macleay, preoccupied.

(For Australian synonymy see Loveridge (1934, p. 300)).

1 (M. C. Z. 4731) New Britain Archipelago (Mus. Godeffroy) 1882.
15 (M. C. Z. 49251–9) Aitape, A. N. G. (W. M. Beck) 1944.
2 (M. C. Z. 49260–1) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
1 (M. C. Z. 49262) Gusiko, A. N. G. (W. H. Stickel) 1944.
5 (M. C. Z. 49264–9) Toem, D. N. G. (W. H. Stickel) 1944.
7 (U. S. N. M. 119176, 119233–8) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119177) Milne Bay, B. N. G. (J. F. Cassell) 1944.
3 (U. S. N. M. 119239–41) Toem, D. N. G. (W. H. Stickel) 1944.

Internasals usually (29 ex.) in contact, or separated by a single granule (5 ex.); supra- and postnasals 3–4; upper labials 7–10 (right side only counted), average 8.5; postmentals 2; dorsal tubercles in 12–20 rows, average 16.5; lamellae under fourth toe 18–23, average 20.5; preanal pores 10–12, no preanal groove; no lateral fold. Length of ♂ (M. C. Z. 49266), 101 (52 + 49) mm., but tail regenerated; largest ♀ (U. S. N. M. 119238), 113 (53 + 60) mm.; youngest (U. S. N. M. 119239), 44 (20 + 24) mm.

Color in life of a ♀ (U. S. N. M. 119236) as recorded by Stickel: Above, rich brown mottled with blackish brown and dull grayish yellow. Below, throat and belly dull, medium dark gray mauve. This gecko, as well as two others taken the same day (May 16), was gravid. All three were found resting on the ground beneath boxes and poles in a tent. Other *G. pelagicus* were taken from deserted foxholes in brushy jungle, beneath piles of vegetational debris mixed with humus, in a shallow burrow beside buttress of stump, while another, detected resting on a tree trunk by day, retreated into a fissure of the bark. It is interesting to note that at both Aitape and Toem *pelagicus* occurs alongside related forms with which it might easily be confused.

Trinomials are not used as *G. p. undulatus* Kopstein, from the Kei Islands does not seem too well established. It was based on a gecko lacking postmentals, a condition apparently permanent in *vankampeni*, but throughout the range of *pelagicus* as far east as Fiji individuals with greatly reduced postmentals are to be found.

Gymnodactylus papuensis Brongersma

Gymnodactylus novae-guineae Brongersma (not of Schlegel), 1928, Zool. Anz., **75**, p. 251, figs. 1a–b: Southern New Guinea.

Gymnodactylus papuensis Brongersma, 1934, Zool. Meded., **17**, p. 173: *nom. nov.* for *novae-guineae* Brongersma, preoccupied.

3 ♂ ♂ (M. C. Z. 49263, 49269–70) Toem, D. N. G. (W. H. Stickel) 1944.

hgr. (U. S. N. M. 119232) Toem, D. N. G. (W. H. Stickel) 1944.

Internasals separated by a single large internasal; supra- and postnasals 3; upper labials 11–12; postmentals 2; dorsal tubercles in 22–24 rows; lamellae under fourth toe 20–22; preanal pores about 8, concealed in a longitudinal preanal groove; a lateral fold. Largest (M. C. Z. 49263), 118 (62 + 56) mm., but tail regenerated as with all.

Stickel took the halfgrown gecko among trash at base of a bushy palm plant on May 26; the three adult males, together with some

G. pelagicus, to which they bear considerable resemblance, were found hiding beneath boxes and poles in a tent on September 2 and 22. This species is an interesting link between *pelagicus* and species like *sermowaiensis* which have a lateral fold.

Gymnodactylus louisadensis Vis

Gymnodactylus louisadensis de Vis, 1892, Ann. Queensland Mus., No. 2, p. 11: "Sudest" = Tagula Island, British New Guinea.

♀ (M. C. Z. 49611) Gusiko, A. N. G. (W. H. Stickel) 1944.
2 ♀ ♀ (U. S. N. M. 119230–31) Gusiko, A. N. G. (W. H. Stickel) 1944.
hgr. (U. S. N. M. 120083) Munda, New Georgia (W. G. Iltis) 1944.

Snout once and three-quarters as long as the eye; supranasals separated by 1 granule; nostril bordered by rostral, first labial, supranasal, and 3–4 postnasals; enlarged dorsal tubercles in 32 rows; ventral scales in 38–42 rows; median series of subcaudals transversely enlarged. Largest perfect ♀ (U. S. N. M. 119230), 237 (115 + 122) mm., surpassed in head-and-body length by one of 122 mm.

In the adults the paired dorsal blotches fuse to form crossbands except for the third pair in the largest female where they remain separate; in the halfgrown gecko from the Solomons the blotches are very irregularly shaped.

Gymnodactylus loriae Boulenger

Gymnodactylus loriae Boulenger, 1897, Ann. Mus. Civ. Stor. Nat. Genova (2), **18**, p. 695, pl. vi: "Haveri and Moroka," Bartholomew Range, 2,300 feet, British New Guinea.

♂ (M. C. Z. 21912) Australian New Guinea (Berlin Mus.) 1925.
juv. (U. S. N. M. 119178) Gusiko, A. N. G. (J. F. Cassel) 1944.

Snout once and a half (juv.) to twice as long as the eye; supranasals separated by 2 granules (larger example injured); nostril bordered by rostral, first labial, supranasal and 3–4 nasals; dorsal tubercles in about 22–26 rows; ventral scales in about 46–56 rows; subcaudals quadrangular, the median series not transversely enlarged. Length of ♂, 274 (156 + 118) mm., of juvenile, 98 (48 + 50) mm.

In the juvenile the lateral fold is scarcely developed and the dorsal tubercles so indistinct as to be uncountable. Its coloring, except for

the black and white annulate tail, differs from that of the adult, being grayish above speckled with brown, chiefly on the tubercles and forming about eight, fine, wavy, transverse lines that are apparently destined to become the outer, darker edges of the four crossbands seen in adults. Below, white, each scale minutely flecked with black.

I am, therefore, by no means certain that these two geckos are conspecific, the very old male displays an uninterrupted *angular* series of 30 + 30 preano-femoral pores, there are a very few enlarged tubercles scattered among the gular granules but not so many as figured by Brongersma (1934, p. 171) for *G. novaeguineae* Schlegel. However it has numerous enlarged tubercles below the lateral fold which Brongersma says distinguishes *novaeguineae* from all other species. On the other hand the subcaudal scaling on the base of the tail agrees best with *loriae* and the dorsal aspect is longitudinally striped as in the type.

Werner (1901, p. 604), followed by Barbour (1921, p. 100), synonymized *loriae* with *louisiadensis*, but in this I think he was mistaken for both his geckos were apparently referable to *loriae*.

Hemidactylus frenatus Duméril & Bibron

Hemidactylus frenatus Duméril & Bibron, 1836, Erpét. Gén., **3**, p. 366: Java (restricted).

Hemidactylus tristis Sauvage, 1878, Bull. Soc. Philom. Paris (7), **3**, p. 49: New Guinea.

3 (M. C. Z. 7602) Saonek, Waigeo Id., D. N. G. (T. Barbour) 1907.
17 (M. C. Z. 7603) Manokwari, D. N. G. (T. Barbour) 1907.
15 (M. C. Z. 7604) Sorong, D. N. G. (T. Barbour) 1907.
6 (M. C. Z. 7617) Humboldt Bay, D. N. G. (T. Barbour) 1907.
4 (M. C. Z. 49271) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119245) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119531) Gamadado, B. N. G. (G. H. Penn) 1944.
2 (U. S. N. M. 120099–100) Amsterdam Id., D. N. G. (G. H. Penn) 1944.

Internasals in contact (7) or separated by a granule (15); nostril surrounded by 3 nasals, rostral, and first labial (except in U.S.N.M. 119531); upper labials 9–13, average 11.5; lower labials 7–10, average 8; dorsal tubercles in 2–6 rows; scansors under fourth toe 7–9 (or 11, if unpaired basal ones are counted); no lateral fold; preanal pores in males 24–39. Largest ♂ (M. C. Z. 7603), 119 (61 + 58) mm., ♀ (M. C. Z. 7604), 98+ (53 + 45+) mm.

The above data applies to 22 specimens only, labial and scansor counts to those on right side only. Comparison with similar data derived from African material reveals no apparent differences. Brongersma (1934, p. 173) synonymized *tristis* after comparing the types with those of *frenatus*.

Hemidactylus garnotii Duméril & Bibron

Hemidactylus garnotii Duméril & Bibron, 1836, Erpét. Gén., **3**, p. 368: Tahiti, Society Islands.

juv.; ♀ (M. C. Z. 49207–8) Manokwari, D. N. G. (T. Barbour) 1907.
♀ (M. C. Z. 49209) Saidor, D. N. G. (C. W. Moren) 1946.

Internasals in contact or separated by a granule; nostril surrounded by 3 nasals, rostral, and first labial; upper labials 8–10; lower labials 7–9; no dorsal tubercles; scansors under fourth toe 8; a lateral fold. Larger ♀ (M. C. Z. 49207), 85+ (50 + 35+) mm., tail regenerating.

Apparently these Manokwari specimens were the first *garnotii* to be taken in New Guinea. They were found among the long series (M. C. Z. 7603) of *Hemidactylus frenatus*, a species with which *garnotii* may be easily confused. On the other hand the claw of the fifth toe is so minute as to be readily overlooked and the gecko assigned to *Gehyra*.

Cosymbotus platyurus (Schneider)

Stellio platyurus Schneider, 1792, Amphib. Physiol., **2**, p. 30: No type locality.

♀ (M. C. Z. 7615) Sorong, D. N. G. (T. Barbour) 1907.

Internasals separated by a granule; nostril surrounded by 3 nasals, rostral, and first labial; upper labials 11; lower labials 8; no dorsal tubercles; scansors under fourth toe 7; a broad lateral cutaneous expansion. Length 87 (47 + 40) mm.

Myers (1943, Copeia, p. 192) points out that *Platyurus* Oken, 1836, being preoccupied by *Platyurus* Ritgen, 1828, *Cosymbotus* Fitzinger, 1843, must now be used.

Gehyra spp.

This genus has long been separated from *Hemidactylus* by the alleged absence of a claw on the fifth toe. However, a minute claw is present in all four species listed below and so far as I know *Gehyra* differs from

Hemidactylus only in the fifth digit lacking a free terminal phalange as pointed out by M. A. Smith (1935, pp. 29, 104).

Gehyra interstitialis Oudemans

Gehyra interstitialis Oudemans, 1894, in Semon, Zool. Forsch. Austr., **5**, p. 134, figs. –: New Guinea.

♂ (M. C. Z. 7314) Fakfak, D. N. G. (A. E. Pratt) 1907.
♂ (M. C. Z. 22905) Merauke, D. N. G. (P. T. L. Putnam) 1927.

Internasals separated by 2 granules; postnasals 3; upper labials 12–16; lower labials 11–13; lamellae and divided scansors under fourth toe 16–18; a lateral fold; a posterior fold on hind limb; preanal pores in males 33–36. Larger ♂ (M. C. Z. 7314), 186 (93 + 93) mm.

Gehyra mutilata (Wiegmann)

Hemidactylus (*Peropus*) *mutilatus* Wiegmann, 1835, Nova Acta Acad. Caesar. Leop.-Carol., **17**, p. 238: Manila, Philippine Islands.

juv. (M. C. Z. 49272) Finschhafen, A. N. G. (W. H. Stickel) 1944.
6 (U. S. N. M. 119247–51, 120352) Gusiko, A. N. G. (W. H. S.) 1944.

Internasals in contact or separated by a single granule; postnasals 2; upper labials 8–10; lower labials 7–8; lamellae and divided scansors beneath fourth toe 10–12; no lateral fold; a posterior fold on hind limb; preanal pores in males 40–41. Larger ♂ (U.S.N.M. 119251), 94 (46 + 48) mm., ♀ (U.S.N.M. 119247), 90 (45 + 45) mm., hatchling (M. C. Z. 49272), 37 (20 + 17) mm.

Stickel records the juvenile as having hatched in early August. Of the adults one female was taken on the trunk of a coconut palm at night, three others hiding beneath bark during daylight.

Gehyra baliola (A. Duméril)

Hemidactylus Baliolus A. Duméril, 1851, Cat. Meth. Rept., p. 38: New Guinea

♀ (M. C. Z. 21934) Pelew Islands (Berlin Mus.) 1925.
♂ (M. C. Z. 120098) Amsterdam Id., D. N. G. (G. H. Penn) 1944.

Internasals separated by 2 or more granules; postnasals 2–3; upper labials 11–12; lower labials 11–12; lamellae and divided scansors be-

neath fourth toe 19–20; no lateral fold; a posterior fold on hind limb; preanal pores in male 21. Head and body of ♂, 76 mm., of ♀, 72 mm., regenerating tails 51–55 mm.

Gehyra oceanica (Lesson)

Gecko occanicus Lesson, 1830, Zool., in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 42, pl. ii, fig. 3: Tahiti and Borabora, Oceania.

♂ (M. C. Z. 4166) New Guinea (E. Gerrard) 1877.
♂ (M. C. Z. 7456) New Britain (Mus. Godeffroy) 1882.

Internasals separated by 1–2 granules; postnasals 3; upper labials 11–13; lower labials 8–11; lamellae and undivided scansors beneath fourth toe 16–18; a lateral fold; a posterior fold on hind limb; preanal pores in males 41–42. Larger ♂ (M. C. Z. 4166), 236 (123 + 113) mm.

Though *oceanica* is genotype of *Gehyra* Gray (1842), minute claws are clearly visible on the fifth toes of both examples. Burt and Burt (1932, p. 498) doubt whether *vorax* Girard is really separable from *oceanica*.

Hemiphyllodactylus typus typus Bleeker

Hemiphyllodactylus typus Bleeker, 1860, Nat. Tijdschr. Ned. Indies, **20**, p. 327: Gunong Paring, Java.

♀ (M. C. Z. 49273) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (U. S. N. M. 119246) Gusiko, A. N. G. (W. H. Stickel) 1944.

Internasals separated by 1–2 granules; postnasals 2; upper labials 11; lower labials 10–11; lamellae and scansors under fourth toe 9–10; preanal pores in male 12. Length of ♂, 70 (40 + 30) mm.

These specimens apparently constitute the first records of the occurrence of *Hemiphyllodactylus* in New Guinea. The ♂ was taken on ground in partly cleared jungle on April 4 by Captain E. S. Ross.

Lepidodactylus lugubris (Duméril & Bibron)

Platydactylus Lugubris Duméril & Bibron, 1836, Erpét. Gén., **3**, p. 304: Tahiti, Society Islands.

3 (M. C. Z. 48568) Aitape, A. N. G. (W. M. Beck) 1944.
3 (M. C. Z. 49274) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
4 (U. S. N. M. 119252–5) Gusiko, A. N. G. (W. H. Stickel) 1944.

Internasals separated by 2–3 granules; postnasals 2; upper labials 11–12; lower labials 9–12; lamellae and scansors under fourth toe 12–19; no males; sides of tail depressed with serrated edge. Largest ♀ (M. C. Z. 49274), 70+ (36 + 34+) mm., tail regenerating; a hatchling is 27+ (13 + 14+) mm.

Shape of tail and color pattern appear to be the best means of separating this gecko from *pulcher* which also occurs at Gusiko. As the three Aitape geckos are tailless, their identification is somewhat questionable. Two Gusiko females, one spent, the other gravid with large eggs, were taken April 5 on the trunk of a coconut palm.

Lepidodactylus pulcher Boulenger

Lepidodactylus pulcher Boulenger, 1885, Cat. Lizards Brit. Mus., **1**, p. 166, pl. xiii, fig. 5: Wild Island, Admiralty Islands.

♀ (M. C. Z. 49612) Gusiko, A. N. G. (W. H. Stickel) 1944.
♂ ♀ (U. S. N. M. 118824–5) Finschhafen, A. N. G. (A. M. Keefe) 1944.
♀ (U. S. N. M. 119248) Gusiko, A. N. G. (W. H. Stickel) 1944.

Internasals separated by 1–2 granules; postnasals 1–2; upper labials 11–12; lower labials 9–10; lamellae and scansors under fourth toe 13–15; preanal pores in male 12; sides of tail rounded. Length of ♂ (U.S.N.M. 118825), 70 (38 + 32) mm., largest ♀ (U.S.N.M. 118824), 76 (39 + 37) mm.

These geckos lack the spotting shown on the head of the figured type; the backs of three are crossed by dark brown, sometimes light-edged, wavy lines, while one (U.S.N.M. 119248) has a pair of dark brown lateral and a pair of dorsolateral lines, the latter enclosing what almost amounts to a pale vertebral band; two only have the four dark spots in the shoulder region which are typical of *lugubris* and present in our big *guppyi* from Stirling Island in the Solomons.

Burt and Burt (1932, p. 505) were mistaken in synonymizing *pulcher* with *guppyi*, but two of the series they called *guppyi* (now in the Museum of Comparative Zoölogy) are in reality *woodfordi* Boulenger. Our *guppyi* is quite distinct.

One Gusiko ♀ was taken on a coconut palm trunk at the same time as *lugubris*; the other beneath bark of a dead tree was, according to Stickel, "brown, marked with dull yellowish gray; belly dull yellow, speckled with mauve brown."

Gekko vittatus Houttuyn

Gekko vittatus Houttuyn, 1782, Verh. Zeeuwsch. Genootsch. Wet. Vlissingen, **9**, p. 325: Indies.

Platydactylus bivittatus Duméril & Bibron, 1836, Erpét. Gén., **3**, p. 334: Waigeo Island, Dutch New Guinea.

10 (M. C. Z. 7597) Jamna Id., D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7599) Ansoes, Jobi Id., D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 48569–70) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49275) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
2 (M. C. Z. 49276–7) Toem, D. N. G. (W. H. Stickel) 1944.
1 (M. C. Z. 49278) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 38961) Jamna Id., D. N. G. (T. Barbour) 1907.
3 (U. S. N. M. 119242–4) Gusiko, A. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 120097, 120349) Amsterdam Id., D. N. G. (G. H. Penn) 1944.
1 (U. S. N. M. 120350) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Internasals in contact (4 ex.) or separated by 1 granule; postnasals 2; upper labials 12–15; lower labials 11–14; lamellae and scansors under fourth toe 18–23; preanal pores in males 21–57, average 42.6 for 13 males. Largest ♂ (M. C. Z. 49278), 203 (93 + 110) mm.; the largest ♀ (U.S.N.M. 119243) measures 95 mm. from snout to anus, tail regenerating; youngest (M. C. Z. 49277), 72 (37 + 35) mm.

De Rooij's (1915, p. 51) key character of "granules on the throat intermixed with larger ones" (*vittatus*), or subequal (*pulcher*), is unreliable to judge by the wide variation displayed by the Jamna series and occasional specimens where the gular granules are more or less uniform. Nor does the diameter of the ear opening into that of the orbit furnish any better indication, for in our series the ear diameter is usually about one-third (*not* half as stated by de Rooij) the eye diameter, and obviously depends on the degree of contraction of the ear opening.

Color in life of two subadults as recorded by Stickel: (M. C. Z. 49276) Above, light olive with faint brown-edged, olive-yellow, vertebral stripe; tail banded brown and dull white. Below, throat and belly white faintly tinged with lavender; limbs pale olive; digital lamellae light lavender. Eye yellowish brown. (U.S.N.M. 119242) Above, olive green with brown-edged, greenish white, vertebral stripe becoming yellow on anterior fork; limbs olive; tail banded brown and brownish white. Below, throat dull white; belly dull greenish white.

The three Gusiko geckos were captured by following bulldozers as they worked through dense secondary jungle composed of bananas,

breadfruit, cocos and spiny palms, etc., from twenty to sixty feet high and about 450 yards from the shore. The Toem juvenile was found beneath a box in a tent.

AGAMIDAE

Goniocephalus dilophus (Duméril & Bibron)

Lophyrus dilophus Duméril & Bibron, 1837, Erpét. Gén., **4**, p. 419, pl. xlvi: New Guinea.

Tiaris megapogon Gray, 1845, Cat. Lizards Brit. Mus., p. 239: *nom. nov.* for *Tiaris dilophus* Duméril & Bibron.

2 skins (M. C. Z. 5265–6) Port Moresby, B. N. G. (S. F. Denton)1883.
1 (M. C. Z. 7487) Aru Islands (A. E. Pratt) *ca.* 1910.

Supraciliary border moderately raised; some enlarged scales below the ear; nuchal and dorsal crests discontinuous; dorsals heterogenous; ventrals strongly keeled. Length (M. C. Z. 7487), 545 (200 + 345) mm.

Goniocephalus godeffroyi (Peters)

Lophura (*Hypsiliurus*) *Godeffroyi* Peters, 1867, Monatsb. Akad. Wiss. Berlin. p. 707, pl. –: Pelew Islands.

1 (M. C. Z. 4706) New Britain Archipelago (Mus. Godeffroy) 1882.

Supraciliary border moderately raised; some enlarged scales below the ear; nuchal and dorsal crests subcontinuous; dorsals homogenous; ventrals strongly keeled. Length 680 (160 + 520) mm.

Goniocephalus papuensis (Macleay)

Tiaris papuensis Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 101: Hall Sound, British New Guinea.

Gonyocephalus (*Lophosteus*) *Albertisii* Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 377: "Nicura," i.e. Nikora, opposite Yule Island, British New Guinea.

1 (M. C. Z. 28660) Ferguson Id., B. N. G. (Brit. Mus.) 1929.
3 (M. C. Z. 44181–3) Bulowat, A. N. G. (H. Stevens) 1933.
2 (M. C. Z. 44184–5) Wau, A. N. G. (H. Stevens) 1933.

Supraciliary border moderately raised; some enlarged scales below the ear; nuchal and dorsal crests discontinuous; dorsals homogenous; ventrals strongly keeled. Largest (M. C. Z. 44182) measures 830 (205 + 625) mm., far surpassing previous records.

Goniocephalus modestus Meyer

Gonyocephalus (*Hypsilurus*) *modestus* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 130: Jobi Island, Dutch New Guinea.

Gonyocephalus (*Arua*) *inornatus* Doria, 1874, Ann. Mus. Civ. Stor. Nat. Genova, **6**, p. 345, pl. xi, fig. e: Aru Island.

1 (M. C. Z. 4709) New Britain Archipelago (Mus. Godeffroy) 1882.
1 (M. C. Z. 7306) Astrolabe Bay, A. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7644) Pom, Jobi Id., D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 49279–80) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49281) Toem, D. N. G. (W. H. Stickel) 1944.
22 (M. C. Z. 49290–9) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119257) Toem, D. N. G. (W. H. Stickel) 1944.

Supraciliary border moderately raised; no enlarged scales below ear; nuchal crest formed of 4–6 widely separated scales; dorsal crest indistinct; dorsals homogenous, small, keeled; ventrals keeled. About the largest ♂ (M. C. Z. 49296), 342 (87 + 255) mm., ♀ (M. C. Z. 49292), 344 (83 + 261) mm., the latter holding eggs ready for laying on August 17–22, 1944.

A slow, passive, sometimes green lizard, often seen on coconut palm trunks, capable of speed when pursued but immobile when being handled. (W. H. Stickel).

Physignathus temporalis (Günther)

Grammatophora temporalis Günther (part), 1867, Ann. Mag. Nat. Hist. (3), **20**, p. 52: Port Essington, Northern Territory, Australia.

1 (M. C. Z. 4141) British New Guinea (E. Gerrard) 1877.
1 (M. C. Z. 20989) Merauke, D. N. G. (Amsterdam Mus.) 1925.
1 (M. C. Z. 22906) Merauke, D. N. G. (P. T. L. Putnam) 1927.

Nostril slightly nearer tip of snout than orbit; gular scales obtusely keeled; keels of dorsals adjacent to the vertebral line directed obliquely towards it; tail slightly compressed, without crest. Largest, a ♂ (M. C. Z. 4141), 388 (97 + 291) mm.

SCINCIDAE

Tribolonotus novaeguineae (Schlegel)

Zonurus novae guineae Schlegel, 1834, Tijdsch. Nat. Gesch. Phys., **1**, p. 218: Fort Merkusoord, west coast of Dutch New Guinea.

2 (M. C. Z. 21062–3) Manokwari, D. N. G. (Amsterdam Mus.) 1925.
1 (U. S. N. M. 119486) Toem, D. N. G. (W. H. Stickel) 1944.

Postmental slightly shorter than anterior pair of chin shields each of which is much larger than the shield following it; caudal spines more or less directed upwards. Largest (M. C. Z. 21063), 154+ (84 + 70+) mm., but surpassed in head and body length by one of 90 mm.

Tribolonotus gracilis Rooij

Tribolonotus gracilis de Rooij, 1909, Nova Guinea, Zool., **5**, p. 381: near Mosso River, Dutch New Guinea.

2 (M. C. Z. 49243–4) Aitape, A. N. G. (W. M. Beck) 1944.

Postmental much shorter than anterior pair of chin shields each of which is very much larger than the shield following it; caudal spines directed backwards. Larger ♂ (M. C. Z. 49244), 173 (97 + 76) mm.

One might feel inclined to regard *graeilis* as an eastern race of *novaeguineae* had not de Rooij recorded both species from Humboldt Bay and Mosso River, Germania Bay, and de Jong (1927, p. 318) reported both from Pionierbivak, Mamberamo River, and (1930, p. 406) both from Albatrosbivak. However, there are records of *novaeguineae* from points east that should be reexamined.

Tropidophorus darlingtoni Loveridge

Tropidophorus darlingtoni Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 47: Mount Wilhelm at 5,000–6,000 feet, Bismarck Range, Australian New Guinea.

♀ & yng. (M. C. Z. 47051–3) Mount Wilhelm, A. N. G. (P. J. Darlington) 1944.

These are the type and paratypes of the first member of the genus to be recorded from New Guinea. A detailed description has been

published; midbody scale rows 34–36; lamellae under fourth toe 12–15. Length of gravid ♀ (M. C. Z. 47051), 116 (63 + 53) mm.

Tiliqua scincoides gigas (Schneider)

Scincus gigas Schneider, 1801, Hist. Amphib., **2**, p. 202: Amboina Island, Ceram Islands.

♂ (M. C. Z. 38994) Astrolabe Bay, A. N. G. (Leiden Mus.) 1935.
♀ (M. C. Z. 49242) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
♂ (U. S. N. M. 119487) Gusiko, A. N. G. (W. H. Stickel) 1944.

Supraoculars 3–4; supraciliaries 3–6; anterior temporals 1–1¼ times as long as the interparietals; forelimb longer than the head, and from 2¾–3¼ times in the distance from axilla to groin; midbody scale rows 30–32; dark crossbands on body 8–10. Larger ♂ (M. C. Z. 38994), 465 (260 + 205) mm., of gravid ♀, 464 (265 + 199) mm.

Trinomials appear necessary owing to the presence on the Kei Islands of *Tiliqua scincoides keiensis* Oudemans, which combines both the characters that serve to separate *gigas* from the Australian *scincoides*. The smaller male was taken beneath a pile of lumber on grassy flats adjacent to a coral cliff.

Mabuya multifasciata multifasciata (Kuhl)

Scincus multifasciatus Kuhl, 1820, Beitr. Zool. Vergl. Anat., p. 126: No locality.

1 (M. C. Z. 7722) Mios Woendi, D. N. G. (T. Barbour) 1907.

Postnasal present; parietals separated; midbody scale rows 30; adpressed hind limb falls short of axilla. Length 189 (75 + 114) mm. The locality appeared as Meosbundi, Wiak Island, Schouten Islands in Barbour (1912, p. 89); Biak now appears to be the preferred spelling for Wiak.

Dasia

The name *Dasia*, recently proposed by Lebour (1938, Proc. Zool. Soc. London, **108**, p. 650) for a genus of decapod Crustacea, was renamed *Dasella* by the same author (1945, Proc. Zool. Soc. London, **115**, p. 279) on account of the prior use of *Dasia* for a genus of skinks.

Dasia smaragdina perviridis Barbour

Dasia smaragdina perviridis Barbour, 1921, Proc. New England Zoöl. Club, **7**, p. 106: Fulakora, Ysabel Island, Solomon Islands.

1 (M. C. Z. 4714) New Britain (Mus. Godeffroy) 1862.
1 (M. C. Z. 7310) Fakfak, D. N. G. (A. E. Pratt) 1903.
24 (M. C. Z. 7707–8, 7482) Sorong, D. N. G. (T. Barbour) 1907.
6 (M. C. Z. 7712) Wooi Bay, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 7713) Manokwari, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 7714) Humboldt Bay, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 7715) Saonek, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 48598) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49284) Owi Id., D. N. G. (E. S. Harald) 1944.
10 (M. C. Z. 49285–9) Liki Id., D. N. G. (W. H. Stickel) 1944.
9 (M. C. Z. 49312–6) Toem, D. N. G. (W. H. Stickel) 1944.
3 (U. S. N. M. 40037–9) Sorong, D. N. G. (T. Barbour) 1907.
1 (U. S. N. M. 119428) Finschhafen, A. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 119429–30) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119431) Hollandia, D. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 119432–3) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119544) Mios Woendi, D. N. G. (G. H. Penn) 1944.
1 (U. S. N. M. 120101) Amsterdam Id., D. N. G. (G. H. Penn) 1944.
1 (U. S. N. M. 122105) Finschhafen, A. N. G. (J. E. Hadley) 1944.

No supranasals; nuchals and dorsals smooth or faintly striated; midbody scale rows 22–26, average 23.4 for seventy-two skinks; enlarged scale on heel. Largest (M. C. Z. 49312), 267 (103 + 164) mm.

Color in life of a Finschhafen skink as recorded by Stickel. Above, green, the posterior half of body and forward portion of tail heavily suffused with grayish brown; legs brownish. Below, lighter. A Gusiko skink of almost the same size is described as having: Head and back green becoming olive-yellowish on tail; forelegs green anteriorly, the rest brown spotted with black and tan, this coloring extending also around the base of each hind limb. Below, pale yellow tinged with green turning to olive-yellow beneath the tail. Of M. C. Z. 49312 Stickel remarks: "Heel scale orange, which is unusual."

Some of these arboreal skinks were seen on trunks of trees and palms, one was taken on the ground.

The subspecific name I am applying to these New Guinea skinks may come as a surprise, for in describing *perviridis* Barbour (1921, p. 106) stated the Solomons' form was "similar to *D. s. smaragdinum*[1] of Papua, but wholly brilliant green throughout; not with a green

[1] Not of Lesson, see succeeding paragraphs.

head, and a body fading to bronze, or in alcohol to brownish, inferiorly." Unfortunately not even a majority of our New Guinea *Dasia* are bronzy posteriorly (25 ex.), wholly green-backed specimens (38 ex.) apparently occurring alongside the others throughout the range or in some localities like Liki Island seemingly to the exclusion of the green and bronze form. Therefore one cannot say that even the green and bronze form so beautifully depicted by Barbour (1912, pl. i, fig. 1) predominates, much depending on the population from which the material happens to be drawn.

The green and bronze lizards represent a stage where *moluccarum* of the Philippines and Moluccas is giving way to the wholly green type. If herpetologists cannot tell whether half the above material came from the Solomons or New Guinea it scarcely seems worthy of separation and a name. *Dasia* from both New Guinea and the Solomons are fairly well distinguished from the other races by the hind limbs being spotted with black and white on a tan ground.

It will be noted that Barbour writes of *s. smaragdina* (Lesson) as having a green head and body fading to bronze posteriorly. But this is in contradiction to Lesson's (1830, p. 43, pl. iii, fig. 1) description and figure which are of a green-backed lizard. If further proof were needed that Lesson's *smaragdina* never came from Papua one has only to look at the hind limbs of his figured type. I consider, therefore, that Barbour's (1912, p. 91) suggestion that Lesson's skink never came from Oualan, Caroline Islands, was not justified. Lesson himself suggested that it might be the opposite sex to *viridipunctata* Lesson (1830, p. 44, pl. iv, fig. 1) also from "Oualan" (= Kusaie Id.). Both types of coloration may be found in our material from the Carolines.

Mertens (1929, p. 218), following Barbour, went even further and restricted the name "*smaragdinum*" to the New Guinea form, an action with which I cannot concur as it came from the Carolines. *Scincus viridipunctus* Lesson becomes a synonym of *Dasia s. smaragdina* (Lesson) and how far one is justified in recognizing *D. s. philippinicum* Mertens as distinct from it, remains to be seen. Both *philippinicum* and *moluccarum* with endless intermediates occur among a series of 32 skinks collected by Dr. E. H. Taylor between Tatayan and Saub on the Cotobato Coast, Mindanao Island, Philippine Islands.

Riopa rufescens (Shaw)

Lacerta rufescens Shaw (part), 1802, Gen. Zool., **3**, p. 285: "Arabia and Egypt" (other part refers to *Eumeces s. schneideri*)

Eumeces oppellii Duméril & Bibron, 1839, Erpét. Gén., **5**, p. 656: New Guinea.

Eumeces uniformis Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 133: Mafoor Island, Dutch New Guinea.

Euprepes (*Tiliqua*) *cingulatus* Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 350: Mansinam Island, Dutch New Guinea.

2 (M. C. Z. 7692) Jamna Id., D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 48605–6) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49341) Finchhafen, A. N. G. (J. W. Jarcho) 1944.
1 (U. S. N. M. 119434) Toem, D. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 119545–6) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Supranasals present or fused with the postnasal; frontal slightly narrower than, as broad as, or slightly broader than the supraocular region; lower eyelid with a scaly, opaque, or semitransparent disk; auricular lobules 5–6; midbody scale rows 26–30; lamellae under fourth toe 16–20. Largest ♂ (M. C. Z. 48605), 314+ (117 + 197+) mm.; ♀ (U. S. N. M. 119546), 330 (127 + 203) mm., smallest (M. C. Z 48606) has a head and body length of 45 mm.

The head and body of this smallest skink show about eighteen white cross lines in striking contrast to the uniformly iridescent brown of the largest. The chin and throat of the young skink show the characteristic series of black chevrons that fade out in half-grown lizards and are quite lacking in the Mios Woendi adults. Both of these are gravid, one holding four eggs approximately 16 x 10 mm.

Riopa albofasciolata (Günther)

Eumeces albofasciolatus Günther, 1872, Ann. Mag. Nat. Hist. (4), **10**, p. 370: North Australia.

1 (M. C. Z. 4762) New Britain (Mus. Godeffroy) 1882.
1 (M. C. Z. 38992) Morotai Id., Molucca Ids. (Leiden Mus.) 1935.

Supranasals present; frontal narrower or broader than the supraocular region; lower eyelid scaly; auricular lobules 5–7; midbody scale rows 34, smooth; lamellae under fourth toe 16–20; larger (M. C. Z. 38992), 238+ (132 + 106+) mm., tail regenerating.

The Museum of Comparative Zoölogy has a score of specimens of *albofasciata* all of which I examined to see if there were grounds for recognizing insular forms. I concluded that *Lygosoma* (*Riopa*) *albofasciolatus boettgeri* Sternfeld (1921, p. 418) of which we have topotypes from Ponapé, Caroline Islands, is invalid. Quite apart from *boettgeri* being preoccupied in *Lygosoma* by Sternfeld's *Emoia boettgeri* in the same paper (1921, p. 406).

Our material showed a range of from 32–38 (extremes rechecked) midbody scale rows, 15–22 lamellae beneath the fourth toe, and obsolescent chevrons or dusky lines on the throat. M. C. Z. 38992, collected by Bernstein in 1863, was received as *rufescens* (Shaw) but despite the close relationship between the species no overlap in midbody scale rows occurs so I hesitate to treat *albofasciolata* as a race of the much smaller *rufescens*. Bernstein's specimen was labelled "Morotai" which Dr. Brongersma informs me is Morotai Island in the Molucca Islands, from where *mentovarium* Boettger was described. As suggested by Sternfeld (1919, p. 418) the name would be available subspecifically should the Molucca skinks prove separable, which is doubtful.

[Lygosoma (Sphenomorphus) variegatum variegatum Peters]

Lygosoma (*Hinulia*) *variegatum* Peters, 1867, Monatsb. Akad. Wiss. Berlin, p. 20: Mindanao Island, Philippine Islands.

L. variegatum has often been recorded from New Guinea, but our New Guinea material differs constantly, as indicated below, from our Philippine specimens of which there are 71 from 9 localities including Mindanao.

Our three skinks (♂, ♀, young) from Sarawak and Dutch Borneo agree fairly closely with the description of *anomalopus* Boulenger, described from Penang but are actually intermediates, to judge by our *anomalopus* from Sumatra which apparently represents yet another race.

The Celebes skinks referred to *variegatum* by Malcolm Smith (1927, p. 216) have a very distinctive dorsal pattern. Smith remarks that their midbody scale rows range from 38–44, a figure higher than any recorded for *variegatum* by Boulenger or de Rooij. The nine specimens from Smith's series now in the Museum of Comparative Zoölogy (M. C. Z. 25395–25403) range from 38–42, but it may be noted that *sarasinorum*, described from "Central Celebes" by Boulenger (1897, p. 210), was said to have 44–46.

The following key may serve to separate the forms hitherto lumped under "*variegatum*" in the Museum of Comparative Zoölogy collections

Key to some of the races of L. (S.) variegatum

1. A conspicuous black patch on nape between tympanum and shoulder; range: Philippine Islands . . . . . *v. variegatum*
   No conspicuous black patch on nape 2

2. Midbody scales 36–38; lamellae under fourth toe 17–23; range: Borneo (see remarks above) . . . . . *v.* subsp.
   Midbody scales 38–44 (? 46); lamellae under fourth toe 20–27 3
3. Back bordered by a conspicuous, cream-colored, dorso-lateral line or series of dashes, between which are two longitudinal series of black blotches (that tend to coalesce and form wavy cross lines in the young); size larger 61 + 100 mm. (76 + 160 if type of *sarasinorum* is included); range: Celebes . . . . . *v. ?sarasinorum*
   Back rarely bordered by a conspicuous, cream-colored, dorso-lateral line; size smaller, under 50 + 80 mm. 4
4. Midbody scale rows 37–42; lamellae under fourth toe 20–27; range: Misool Island and Dutch New Guinea . . . . . *v. jobiense*
   Midbody scale rows 42–46; lamellae under fourth toe 23–29; range: Australian New Guinea . . . . . *v. stickeli* subsp. nov.

Lygosoma (Sphenomorphus) variegatum jobiense Meyer

Lygosoma (*Hinulia*) *jobiensis* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 131: Jobi Island, Dutch New Guinea.

Lygosoma misolense Vogt, 1932, Zool. Anz., **76**, p. 324: Misool Island, Molucca Islands.

1 (M. C. Z. 7701) Pom, Jobi Id., D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7702) Jende, Roon Id., D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7703) Manokwari, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7704) Ansoes, Jobi Id., D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 7706) Sorong, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 27944) Lake Sentani, D. N. G. (P. Wirz) 1929.
2 (M. C. Z. 49248–9) Aitape, A. N. G. (W. M. Beck) 1944.
1 (U. S. N. M. 119461) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 121218) Sansapor, D. N. G. (G. M. Kohls) 1944.

No supranasal; nasal entire; upper and lower loreal; supraoculars 6–8, the anterior ones in contact with the frontal; midbody scale rows 37–42 (42 in U. S. N. M. 121218 only); lamellae under fourth toe 20–27. Largest (U. S. N. M. 121218), 112 (50 + 62) mm., but surpassed in tail length by a ♂ (M. C. Z. 7706), 123 (46 + 77) mm.

Stickel remarks that the Toem skink was taken during clearing of secondary growth on reddish sandy soil about 450 yards inland.

Meyer's brief description states that the Jobi Island type had 38 scale rows and was distinguished from *elegans* Gray (now a syn. of

[1] Not of Boulenger (1887, p. 247) et al.

t. tenuis Gray) by the black lateral band extending forward beyond the anterior corner of the eye. Two statements that clearly indicate he was not describing the larger skink (*L.* (*S.*) *megaspila papuense*) of which we also have examples from Jobi Island.

Lygosoma (Sphenomorphus) variegatum stickeli subsp. nov.

Type. Museum of Comparative Zoölogy No. 49326, a gravid ♀ from Gusiko, Australian New Guinea, collected by W. H. Stickel, May 8–13, 1944.

Paratypes.

5 (M. C. Z. 49327–9, 49615–6) Gusiko, A. N. G. (W. H. Stickel) 1944.
9 (U. S. N. M. 119450–1, 119453, 119456–60) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 120106) Draeger Harbor, A. N. G. (G. H. Penn) 1944.

Diagnosis. Differs from the western race, *L. v. jobiense* Meyer, in slightly larger size and more numerous midbody scale rows. In both scale rows and lamellae it resembles the still larger, but very differently colored, *L.* (*S.*) *megaspila papuense* (Macleay) occurring in the same localities. Many of the Gusiko females are gravid.

Description. Rostral in contact with a divided frontonasal (divided in 6 paratypes, undivided in 9) and sometimes an additional azygous shield; no supranasal; nasal entire (semidivided on left of U. S. N. M. 119457, divided in 119451); two superposed loreals; supraoculars 7 (6–8 in paratypes), the first four (three in all Gusiko paratypes) in contact with the frontal; midbody scale rows 44 (42–46, average 44); lamellae under fourth toe 24 (23–29, average 26.4).

Color. Substantially that of *L. v. jobiense* but with little black on flanks.

Size. Total length of ♀ type, 118 (45 + 73) mm., surpassed by a ♂ (U. S. N. M. 119456) of 127 (47 + 80) mm., and ♀ (U. S. N. M. 120106) of 125 (49 + 76) mm.

Habits. Diurnal and terrestrial according to Stickel.

Lygosoma (Sphenomorphus) megaspila megaspila (Günther)

Hinulia megaspila Günther, 1877, Proc. Zool. Soc. London, p. 128, pl. xxviii: Duke of York Island = Atafu, Tokelau Islands.

L(ygosoma) jobiense elegans Sternfeld, 1921 (1920), Abhand. Senckenberg. Naturf. Ges., **36**, p. 397, pl. xxxi, fig. 1: Ross Island, "Neu Pommern" = New Britain.

1 (M. C. Z. 4707) New Britain Archipelago (Mus. Godeffroy) 1882.
2 (M. C. Z. 33532–3) Ross Id., New Britain (Mus. Senckenberg) 1932.

No supranasal; nasal entire; upper and lower loreal; supraoculars 5–6, the two anterior ones in contact with the frontal; midbody scale rows 44–48; lamellae under fourth toe 24–27. Largest (M. C. Z. 4707), 212 (88 + 124) mm.

Hinulia megaspila Günther was placed in the synonymy of *jobiense* Meyer by Boulenger (1887, p. 247) which I regard as a very different reptile (*vide L. variegatum jobiense* Meyer). Günther gave the midbody scale rows of *megaspila* as 41–47, so I restrict his name to the eastern form with 44–48 scale rows. Our Ross Island skinks are paratypes of *elegans* Sternfeld, a name preoccupied in *Lygosoma* by *Hinulia elegans* Gray.

Lygosoma (Sphenomorphus) megaspila papuense (Macleay)

Hinulia papuensis Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 62: "Katow" = Binaturi River, British New Guinea.

Lygosoma amblyplacodes Vogt, 1932, Sitzb. Ges. Naturf. Freunde Berlin, p. 283: Australian, New Guinea.

1 (M. C. Z. 7685) Wooi Bay, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 7686) Jamna Id., D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 44188–90) Wau, A. N. G. (H. Stevens) 1933.
5 (M. C. Z. 48574–8) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49330) Langemak Bay, A. N. G. (C. W. Moren) 1944.
1 (M. C. Z. 49331) Gusiko, A. N. G. (W. H. Stickel) 1944.
8 (M. C. Z. 49332–7) Toem, D. N. G. (W. H. Stickel) 1944.
3 (M. C. Z. 49338–9) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 37287) Australian New Guinea (Berlin Mus.).
2 (U. S. N. M. 119179–80) Gusiko, A. N. G. (J. F. Cassel) 1944.
3 (U. S. N. M. 119435–7) Finschhafen, A. N. G. (W. H. Stickel) 1944
11 (U. S. N. M. 119438–48) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119449) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119452) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 124928) Biak Id., D. N. G. (W. M. Welch) 1944.

No supranasal; nasal entire, semidivided or divided; upper and lower anterior loreals; supraoculars 3–7 (3 on left side of U. S. N. M. 124928 only, which has 5 on right), the two (31 ex.) or three (10 ex.) anterior ones in contact with the frontal (without geographical significance); midbody scale rows 39–44 (39 in one Toem skink only); lamellae under fourth toe 21–29. Largest ♂ (M. C. Z. 49339), 234

(91 + 143) mm., but surpassed in body length by eight others ranging from 92–96 mm., smallest (M. C. Z. 49337), 70 (28 + 42) mm.

It is questionable whether this race can be maintained for Hediger (1934, p. 458) gives a range of 40–46 midbody scale rows for "*jobiense*" in New Britain, at most New Guinea skinks *average* lower. Vogt's 90 + 150 mm. holotype of *amblyplacodes* appears to be a *papuense* in which the nasal is divided, a not uncommon condition, enabling him to call the upper portion a supranasal.

The first three skinks listed above were referred by Barbour (1912, p. 90) to "*jobiense*," with which this species has long been confused, but the Pom specimen mistaken for a young "*jobiense*" was actually a gravid *minutum* Meyer.

Color in life of a Finschhafen skink as recorded by Stickel, was: Above, olive brown with black markings; eyelids edged with yellow; posterior part of lips and about ear suffused with orange; tail brown with black markings and rows of tan spots. Below, throat, chest and forelegs suffused with orange; tail watery pink.

A gravid ♀ taken by Stickel at Gusiko on April 11, was: Above, head anteriorly olive green, rest olive brown and black; eyelids yellow; upper lips strongly tinged with orange; sides gray brown spotted with tan; legs black mottled with brown; a dorso-lateral row of orange spots on posterior trunk and most of tail. Below, scales of chin and throat edged or tinged with orange; throat ventro-laterally, front of forelegs, and sides on same plane, tinged with orange; belly pale opalescent; limbs pale lavender; anterior third of tail rosy orange, posterior two-thirds pale bluish.

Stickel remarks that none of the Toem specimens possess the lovely pastel colors characteristic of Gusiko skinks; this is especially true as regards their underparts which are almost colorless in the Toem skinks. It might be added that Gusiko lizards were taken between April 4 and May 18, the Toem ones from May 26 to October 9. The Biak Island skink alone lacks the heavy black streaks on sides of neck and shoulder, suggesting by its pallid appearance a low-lying, sandy habitat.

Though a young one was taken resting on a twig in a shrub,Stickel states that the species is essentially terrestrial, scurrying when disturbed to seek shelter beneath leaves or, when pursued, making for some deep burrow that has its opening between the buttress roots of a tree. Four Toem skinks were taken in abandoned foxholes beside a track through scrub, one on the ground in jungle, another beneath a rotting log.

Lygosoma (Sphenomorphus) melanopogon Duméril & Bibron

Lygosoma melanopogon Duméril & Bibron (part), 1839, Erpét. Gén., **5**, p. 723: New Guinea.

1 (M. C. Z. 28681) Mimika River, D. N. G. (Brit. Mus.) 1929.

No supranasal; nasal entire; a single loreal; supraoculars 7; the four anterior ones in contact with the frontal; midbody scale rows 48; lamellae under fourth toe 17. Length 184 (89 + 95) mm. Closely related to *m. megaspila* and *m. papuense* but differing from both in having a single loreal.

Lygosoma (Sphenomorphus) striolatum kühnei Roux

Lygosoma (*Hinulia*) *Kühnei* Roux, 1910, Abhand. Senckenberg. Naturf. Ges., **33**, p. 237, pl. xiii, fig. 2: Kei Islands, Dutch East Indies.

Cotype ♀ (M. C. Z. 27945) Kei Ids., S. W. of D. N. G. (Basel Mus.) 1929.

No supranasals; nasal entire; a single anterior loreal; supraoculars 7, the four anterior ones in contact with the frontal; midbody scale rows 40; lamellae under fourth toe 29. Length of gravid ♀, 132 (52 + 80) mm.

When describing *kühnei* Roux compared it with *melanopogon*, making no mention of *striolatum* Weber from the nearby island of Damma. Weber's species was said to have finely striate scales, while those of *kühnei* were allegedly smooth; under strong magnification, however, there is a suggestion of striae in *kühnei* and certainly our specimen does not differ in this respect from eight *striolatum* collected by E. R. Dunn on Komodo Island. The adpressed hind limb of *striolatum* was *said* to reach the tympanum, but does not extend far beyond the shoulder in our series, some only to the shoulder as in *kühnei*. Both species have 40–42 midbody scale rows, while the lamellae under the fourth toe number 26–30 in our *striolatum*, 29–34 in *kühnei*. *L. kühnei* is treated as a race on account of some slight color differences; our gravid ♀ has a black throat while all our *striolatum* are immaculate white below.

Lygosoma (Sphenomorphus) aruense (Doria)

Eumeces aruensis Doria, 1874, Ann. Mus. Civ. Stor. Nat. Genova, **6**, p. 335, pl. xi, fig. c: Aru Islands, south of Dutch New Guinea.

Lygosoma rufum Boulenger, 1887, Cat. Lizards Brit. Mus., **3**, p. 239: "Wokan" i.e. Wokam Island, Aru Islands.

Lygosoma (*Leiolopisma*) *papuae* Kinghorn, 1928, Rec. Australian Mus., **16**, p. 292, fig. 1: Mount Lamington district, British New Guinea.

♂, 5 ♀ ♀, 2 yng. (M. C. Z. 47059–66) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Prefrontals narrowly or broadly in contact, fused into a single shield in M. C. Z. 47064; supraoculars 4 (5–6 if some very small posterior ones are included); supraciliaries 6–8; upper labials 7–8; the fifth (in M. C. Z. 47059 as in type of *rufum*) or sixth (in rest of series) below the eye; lower labials 6–7; ear-opening as large as, or smaller than, the eye opening; midbody scale rows 32–36; lamellae under fourth toe 19–22; toes of the adpressed hind limb overlapping the fingers of the backward pressed forelimb only in specimens with a head and body length under 61 mm., *they are widely separated in all adult females;* the distance from tip of snout to forelimb is contained $1\frac{1}{3}$ to $1\frac{2}{3}$ in the distance from axilla to groin. Length of ♂ (M. C. Z. 47065), 163 (61 + 102) mm., ♀ (M. C. Z. 47063), 181 (75 + 106) mm. One gravid ♀, taken October 13–26, holds three unpigmented embryos.

Eumeces aruensis Doria was synonymized with "*jobiense*" (i.e. *megaspila* of this report) by Boulenger (1887, p. 247) on the strength of a specimen sent him by the Marquis of Doria as representing "*aruensis,*" but this skink was not one of the thirteen cotypes but came from Ansoes, Jobi Island, where *megaspila papuense* might be expected to occur.

The fact that Boulenger omitted the low number of 36 midbody scale rows from his redescription of "*jobiense,*" suggests that the skink sent him by Doria had the higher number of *megaspila.*

Our eight specimens, though variable, appear to agree well with the description and figure of *aruensis* except that the figure shows a clearly delineated transparent disk. Though the lower eyelids are semi-transparent in our series there is no actual disk. Otherwise they also agree with Kinghorn's description of *papuae* except that by its shape the foremost supraocular in *papuae* appears to be divided. Comparative studies may possibly show that *papuae* can be used in a subspecific sense.

The lighter variegations of which Boulenger writes, tend to form on the flanks vertical stripes that nearly meet on the back and correspond to the wavy crossbands mentioned by Kinghorn. They are particularly well defined in the youngest skink (M. C. Z. 47062). Below, the throat of adult females may be with or without conspicuous dark vermiculations.

Lygosoma (Sphenomorphus) consobrinum maindroni Sauvage

Lygosoma (Hinulia) maindroni Sauvage, 1879 (read 22.xi.78), Bull. Soc. Philom. Paris (7), **3**, p. 55: "Haas" (? Haar), Dutch New Guinea.

2 (U. S. N. M. 119532–3) Gamadodo, B. N. G. (G. H. Penn) 1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals in contact; supraoculars 4–5, the two anterior ones in contact with the frontal; nuchals 5 pairs; midbody scale rows 30; lamellae under fourth toe 24. Larger ♂ (U. S. N. M. 119532), 104 (44 + 60) mm.

Trinomials are used as this skink differs but slightly from our topotype of *L. c. consobrinum* Peters & Doria (15.x.1878, p. 342) from "Batcian" = Batjan Island, Molucca Islands.

Lygosoma (Sphenomorphus) pardale moszkowskii Vogt

Lygosoma moszkowskii Vogt, 1912, Sitzb. Ges. Naturf. Freunde Berlin, p. 357: Dutch New Guinea.

1 (M. C. Z. 7668) Sorong, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 21064) Merauke, D. N. G. (Amsterdam Mus.) 1925.
1 (M. C. Z. 49340) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
1 (U. S. N. M. 119462) Finschhafen, A. N. G. (W. H. Stickel) 1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals separated; supraoculars 4–5, the two anterior ones in contact with the frontal; nuchals 4–5 pairs; midbody scale rows 26–28; adpressed limbs fail to meet; lamellae under fourth toe 14–19. Largest (M. C. Z. 7668), 124+ (55 + 69+) mm., tail regenerating.

Color in life of an 80 (35 + 45) mm. skink as recorded by Stickel: Snout reddish-orange brown; body brown flecked with black; tail black flecked with lighter. Terrestrial.

Differs from *L. p. pardale* of the southeast only in its more uniform coloring. One wonders whether the Astrolabe Bay skink referred to *emigrans* Lidth de Jeude by de Rooij (1915, p. 180) is not really a *pardale* with ill-developed nuchals.

Lygosoma (Sphenomorphus) pardale pardale (Macleay)

Hinulia pardalis Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 63: Barrow Island, Queensland.

Lygosoma (Hinulia) elegantulum Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 344: Somerset, Cape York, Queensland.

?*Lygosoma nigrolineatum* Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 6: Mount Victoria, Owen Stanley Mountains, British New Guinea.

♂ (M. C. Z. 10200) S. E. Cape of B. N. G. (Australian Mus.) 1914.

Midbody scale rows 26; lamellae under fourth toe 18. Length ♂, 180 (75 + 105) mm.

This specimen, received as *elegantulum*, agrees with our extensive series of *p. pardale* from Queensland and islands in the Torres Straits, also with the description of *nigrolineatum* except in coloration, having many black dashes on the dorsum but no definite dorsolateral lines. Such lines, longitudinal or transverse, are formed by fusion of the black markings. From the skinks referred to *L. p. moszkowskii* it differs only in the more abundant spotting; in the two mid-dorsal rows being less noticeably enlarged transversely, a character which is variable in our Queensland series, even as between skinks from the same locality; and in the adpressed limbs just meeting, a character probably correlated with its large size.

Lygosoma (Sphenomorphus) minutum Meyer

Lygosoma (*Hinulia*) *minuta* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 132: Dutch New Guinea.

Lygosoma minuta var. *typica* de Jong, 1927, Nova Guinea, **15**, p. 312: n.n. for type of *minuta* Meyer.

Lygosoma minuta var. *obtusirostrum* de Jong, 1927, Nova Guinea, **15**, p. 312, fig. 3a: Upper Sermowai River, Dutch New Guinea (restricted).

Lygosoma minuta var. *rotundirostrum* de Jong, 1927, Nova Guinea, **15**, p. 313, fig. 3b: Parana Valley, Dutch New Guinea (restricted).

♀ (M. C. Z. 7687) Pom, Jobi Id., D. N. G. (T. Barbour) 1907.
♀ (U. S. N. M. 119463) Toem, D. N. G. (W. H. Stickel) 1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals minute, widely separated; supraoculars 4, the two anterior ones in contact with the frontal; nuchal developed on one side only; midbody scale rows 22; lamellae under fourth toe 15–16. Larger ♀ (M. C. Z. 7687), 74 (35 + 39) mm.

The Jobi Island skink, mistaken for a young "*Sphenomorphus jobiense*" by Barbour (1912, p. 90), is actually gravid, the body cavity being almost filled by an egg measuring 8 x 3 mm. Also gravid is the Toem skink taken on June 9 among dead leaves on jungle floor at edge of clearing, by John M. Kern for W. H. Stickel. It is 2 mm. longer in head and body than the other but lacks a tail.

Ictiscincus as a section of Lygosoma

Malcolm Smith (1937, p. 222) suggests separating half a dozen New Guinean-Solomons' skinks from his "section" *Lygosoma* on the fang like character of the larger species. After examining several specimens the differences appear so slight as to make the change inadvisable. I therefore retain *pratti* and *solomonis* in the subgenus *Lygosoma*.

Lygosoma (Lygosoma) pratti pratti Boulenger

Lygosoma pratti Boulenger, 1903, Proc. Zool. Soc. London, p. 128, pl. xiii, fig. 1: Dinawa, 4,000 feet, Owen Stanley Mountains, British New Guinea.

1 (M. C. Z. 10176) British New Guinea (Australian Mus.) 1914.
2 (M. C. Z. 48596–7) Aitape, A. N. G. (W. M. Beck) 1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals separated; supraoculars 4, the two anterior ones in contact with the frontal; nuchals absent (though the semicircle of scales bordering the parietals are slightly enlarged and undoubtedly correspond to what Vogt called nuchals and temporals in his description of *neuhaussi*); midbody scale rows 34–36; lamellae under fourth toe 16–18 (13–14 in cotypes of *pratti*). Larger (M. C. Z. 10176), 191 (80 + 111) mm.

Trinomials are used as there is undoubtedly a western race — *wollastoni* — only distinguishable by average scale counts. As the cotypes of *pratti* had fewer subdigital lamellae it is possible our Aitape skinks should be referred to another race. *L. p. neuhaussi* Vogt (1911, p. 422) from Satelberg, A. N. G., appears to differ from typical *pratti* only in the 34–38 midbody scale rows, the tail being allegedly angular below, and the dorsal longitudinal lines. In this connection it is interesting to note that two of our *L. p. wollastoni* (*vide infra*) have these longitudinal lines resulting from the usual transverse lines breaking up and coalescing longitudinally. *L. p. jeudi* Boulenger (1914, p. 26) apparently differs only in having the prefrontals in contact.

Lygosoma (Lygosoma) pratti wollastoni Boulenger

Lygosoma wollastoni Boulenger, 1914, Trans. Zool. Soc. London, **20**, p. 261, pl. xxx, fig. 1: Mimika River, Dutch New Guinea.

2 (M. C. Z. 49617–8) Toem, D. N. G. (W. H. Stickel) 1944.
8 (U. S. N. M. 119464–7, 119469–71,–73) Toem, D. N. G. (W. H. Stickel) 1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals separated; supraoculars 4, or 5 if a small posterior scale is included, the one or two anterior ones in contact with the frontal; nuchals absent (though the semicircle of scales bordering the parietals are slightly enlarged); midbody scale rows 32–36 (36 in M. C. Z. 49617 only); lamellae under fourth toe 16–19. Largest ♂ (U. S. N. M. 119466), 200 (78 + 128) mm., ♀ (U. S. N. M. 119465), 150+ (81 + 69+) mm.

Color in life of a gravid ♀ (U. S. N. M. 119465) as recorded by Stickel. Above, head blackish brown with yellowish white markings on sides and on neck; back brownish orange mottled with brown, the ground color being most evident on the middle of the sides; tail brownish black speckled with white or with white bands invaded with brown. Below, chin and throat anteriorly whitish mauve barred with purplish brown; belly pale lemon; tail tinged with yellow at base, white mesially, brown on distal half.

A gravid ♀ (U. S. N. M. 119465) held three eggs measuring 17 x 8 mm. on June 13. Most of the series were taken by following bulldozers as described for *L.* (*L.*) *s. schodei* below.

Lygosoma (Lygosoma) solomonis schodei Vogt

Lygosoma schodei Vogt, 1912, Sitzb. Ges. Naturf. Freunde Berlin, p. 6: "Valise" = Walif or Guilbert Island, Australian New Guinea.

Lygosoma longicaudatum de Rooij, 1915, Rept. Indo-Austr. Archip., **1**, p. 220, fig. 84: Lorentz River, Dutch New Guinea.

Cotype (M. C. Z. 37206) Valise Id., A. N. G. (Schoede) 1933.
11 (M. C. Z. 48591–5) Aitape, A. N. G. (W. M. Beck) 1944.
6 (M. C. Z. 49342–6) Toem, D. N. G. (W. H. Stickel) 1944.
1 (M. C. Z. 49393) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119463) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119474) Gusiko, A. N. G. (W. H. Stickel) 1944.
9 (U. S. N. M. 119475–83) Toem, D. N. G. (W. H. Stickel)1944.

No supranasal; nasal entire; a single anterior loreal; prefrontals separated (barely in U. S. N. M. 119482); supraoculars 4, possibly 5, the two anterior ones in contact with the frontal; nuchals 3–6 pairs (a single nuchal on one side of U. S. N. M. 119478, 2 or 3 feebly developed on the other); midbody scale rows 26–28; lamellae under fourth toe 13–18, average 15.1 for 27 skinks. Largest ♂ (U. S. N. M. 119476), 148+ (67 + 81+) mm., ♀ (U. S. N. M. 119475), 160 (63 + 97) mm., the smallest (M. C. Z. 49342), 58 (22 + 36) mm., was hatched in the laboratory on July 22.

Color in life of M. C. Z. 49346 as recorded by Stickel: Above, head dull red suffused with brown, back grayish brown and black. Below, chin and anterior part of throat dull white; rest of throat and anterior part of abdomen yellowish; posterior part of abdomen, and tail (including sides) orangeish. U. S. N. M. 119463 measuring 116 (52 + 64) mm., differs from all the rest in being unspotted above and spotted below, each scale on the ventral surface having a dusky center. This condition is occasionally approached in the others only on the underside of the tail. Whether it indicates a subspecific difference remains to be seen.

Nine were taken by following bulldozers clearing secondary growth jungle on moist, loose, rather sandy, reddish soil about 450 yards from the ocean beach. Several others during the removal of heaps of trash mixed with humus and earth. One was found in a foxhole.

Lygosoma (Leiolopisma) flavipes Parker

Lygosoma flavipes Parker, 1936, Ann. Mag. Nat. Hist. (10), **17**, p. 89: Mondo, British New Guinea.

♂ ♂ ♀ (M. C. Z. 47054–6) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Frontonasal broader than long; supraoculars 4, the foremost 2 in contact with the frontal; frontal as long as, or longer than, the frontoparietals and interparietal together; interparietal moderate; supraciliaries 6–10; upper labials 7–8; lower labials 6–10; midbody scale rows 38–42; limbs pentadactyle; digits dilated; lamellae under fourth toe 19–22; length from snout to forelimb contained $1\frac{1}{3}$ (♀ and halfgrown ♂) to $1\frac{1}{5}$ (adult ♂) times in the distance between axilla and groin; toes of adpressed hindlimb reach wrist of backward-pressed forelimb.

Apart from all three of these skinks (one ♂ is now in Leiden Museum) having distinct, though small, palpebral disks in the lower eyelid, they agree well with Parker's description of the holotype ♀, the only known specimen, so that the data furnished above extends our knowledge of the variational range. Apparently there is sexual dichromatism for the coloring of our ♀ corresponds fairly closely with that of the holotype except that the white temporal bar and lateral flecks are lacking (present in the ♂♂). The males, however, are dark reddish brown above, lighter on the flanks, with 8 irregular, silvery gray crossbars on nape and back, and about 10 more on the tail.

Length of adult ♂ (M. C. Z. 47054), 194 (88 + 106) mm., of subadult ♀ (M. C. Z. 47056), 168 (70 + 98) mm.

Lygosoma (Leiolopisma) prehensicauda Loveridge

Lygosoma (Leiolopisma) prehensicauda Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 48: Mount Wilhelm at 7,500–8,000 feet, Bismarck Range, Australian New Guinea.

♂ ♂ (M. C. Z. 47057–8) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

These are the type and paratype of which full particulars have been published; midbody scale rows 38; lamellae under fourth toe 15–18. Type ♂ (M. C. Z. 47057), 141 (69 + 72) mm.

Lygosoma (Leiolopisma) elegantoides lobulus Loveridge

Lygosoma (Leiolopisma) elegantoides lobulus Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 49: Mount Wilhelm at 7,500–8,000 feet, Bismarck Range, Australian New Guinea.

16 (M. C. Z. 47067–82) Mt. Wilhelm, A. N. G. (P. J. Darlington)1944.

These are the type and paratypes of which full particulars have been published; midbody scale rows 34–36; lamellae beneath fourth toe 19–24. Type ♂ (M. C. Z. 47067), 146 (60 + 86) mm.

The name *elegantoides* was proposed by Ahl for *elegans* Boulenger, preoccupied in *Lygosoma* by *Hinulia elegans* Gray.

Lygosoma (Leiolopisma) virens virens (Peters)

Lipinia virens Peters, 1881, Sitzb. Ges. Naturf. Freunde Berlin, p. 81: British New Guinea.

1 (M. C. Z. 10164) Kiriwina Id., B. N. G. (Australian Mus.) 1914.
1 (M. C. Z. 48579) Aitape, A. N. G. (W. M. Beck) 1944.
1 (U. S. N. M. 119181) Gusiko, A. N. G. (J. F. Cassel) 1944.
20 (U. S. N. M. 119335–54) Gusiko, A. N. G. (W. M. Stickel) 1944.

Frontonasal broader than long; supraoculars 5, rarely 6 (in three specimens only), the two (rarely three or four; four on right side of M. C. Z. 10164 only) anterior ones in contact with the frontal; frontoparietal paired or *single* (single in five Gusiko skinks, semidivided in others); interparietal large; ear-opening small; midbody scale rows

32–34; limbs pentadactyle; digits dilated basally; subdigital lamellae transversely enlarged on basal portion; lamellae beneath fourth toe 14–15 + 6–8 distally (U. S. N. M. 119347 has the distal portion missing from all digits). Largest ♂ (M. C. Z. 10164), 110 (55 + 55) mm., though other males surpass it with tail lengths of 65 and 67 mm. respectively; smallest (U. S. N. M. 119352), 54 (27 + 27) mm.

Color in life of U. S. N. M. 119337 as recorded by Stickel: Above, olive tinged with bronze; eyelids edged with yellow; lips green; neck and flanks flecked with light green; bronze brown especially strong on posterior portion of body; legs olive mottled with green. Below, chin and throat tinged with pale yellowish green; belly slightly iridescent greenish white, the lower flanks mottled with brown; legs and tail a dull yellowish green darker than the belly. Apparently there is a good deal of variation, for others are described as having the parietal and temporal areas suffused with reddish brown; bodies bright olive green; chin and throat green; bellies bright yellow.

Though common on bushes and tree trunks, very elusive and difficult to snare or catch (W. H. S.). *L. anolis* Boulenger (1883) is a race of *virens* and not the reverse as stated by Malcolm Smith (1937, p. 224, footnote).

Lygosoma (Leiolopisma) semoni Oudemans

Lygosoma semoni Oudemans, 1894, in Semon, Zool. Forsch. Austr., **5**, p. 142: New Guinea.

♀ (M. C. Z. 48580) Aitape, A. N. G. (W. M. Beck) 1944.

Frontonasal broader than long; supraoculars 4 (or with a triangular-shaped fifth), the two anterior ones in contact with the frontal; frontoparietal paired; interparietal large; ear-opening small; midbody scale rows 28; limbs pentadactyle; digits dilated basally; subdigital lamellae transversely enlarged on basal portion; lamellae beneath fourth toe 13 + 8 distally. Length of head and body 74 mm.

This specimen also differs from the description given by de Rooij (1915, p. 234) in having the fifth and sixth (not sixth and seventh) upper labials below the orbit; toes of adpressed hind limb just meet finger tips (not wrist); 9½ (not 8) dark transverse bands on nape and back.

Parker (1936, p. 89) suggests that there is a northern (typical) form with 26 midbody scale rows, and a southern one with 28, for all seven specimens in the British Museum have the higher number. The Aitape skink shows that, as in other species, it is between west and east.

Lygosoma (Leiolopisma) longiceps Boulenger

Lygosoma longiceps Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 408: Trobriand Islands, British New Guinea.

6 (M. C. Z. 48584–8) Aitape, A. N. G. (W. M. Beck) 1944.
2 (M. C. Z. 49613–4) Gusiko, A. N. G. (W. H. Stickel) 1944.
6 (U. S. N. M. 119356–9–62–63) Gusiko, A. N. G. (W. H. Stickel)1944
1 (U. S. N. M. 120107) Draeger Harbor, A. N. G. (G. H. Penn) 1944.

Frontonasal longer than broad; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietals paired (partially fused in U. S. N. M. 119363); interparietal large; ear-opening small; midbody scale rows 22–26 (22 in U. S. N. M. 119356 only; 24 in rest of Gusiko series; 26 in Aitape series and U. S. N. M. 120107); limbs pentadactyle; digits dilated; subdigital lamellae transversely dilated; lamellae under fourth toe 12–16 + 4–6 distally. Largest skink with original tail, a ♂ (M. C. Z. 48584), 96 (40 + 56) mm., but surpassed in head and body lengths of 41–42 mm., head and body length of smallest 19 mm.

The holotype of *longiceps* was said to have 24 midbody scale rows, but this was later corrected by Parker (1940, p. 266) who found it had 26. Thus there appears to be no geographical significance in 26 at Aitape as 22–24 occur at Gusiko in an intermediate coastal area.

Color in life of U. S. N. M. 119359 as recorded by Stickel: Above, head sooty with pale yellowish green stripe continued on back as a vertebral stripe flanked with olive brown, the olive brown stripes converging posteriorly and becoming reddish brown, anteriorly they are edged by a black line, below which is a bronze dorso-lateral band with an olive area below fading into the pale, metallic gold belly; limbs dappled with light brown and black; tail orange bronze above and pale dull orange below; in young specimens brighter dull orange.

An active species living on tree trunks, quick to retreat into crevices and consequently hard to catch (W. H. S.).

Lygosoma (Leiolopisma) noctua noctua (Lesson)

Scincus noctua Lesson, 1830, Zool., in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 48: "Qualan" = Kusaie Island, Caroline Islands.

Lygosoma (*Lipinia*) *aurea* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 132: Jobi Island, Dutch New Guinea.

1 (M. C. Z. 7657) Sorong, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 48589–90) Aitape, A. N. G. (W. M. Beck) 1944.

1 (M. C. Z. 49351) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 124639) Toem, D. N. G. (W. H. Stickel) 1944.

Frontonasal as broad as, or broader than, long; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietal paired; interparietal large; ear opening moderate; midbody scale rows 24–26; limbs pentadactyle; digits not dilated; subdigital lamellae more or less enlarged; lamellae under fourth toe 18–22. Largest (M. C. Z. 48589), 87 (40 + 47) mm.

Color in life of U. S. N. M. 124639 as recorded by Stickel: Above, head spot yellow; back ruddy bronze with yellow dorso-lateral stripes; sides spotted with yellow; tail bronzy orange ringed with orange-yellow spots. Below, throat and chin faintly greenish yellow, belly pale dull-greenish yellow. Of another specimen (M. C. Z. 49351) he writes: Stripes dull cream, tail orange.

One of these arboreal skinks was taken beneath loose bark on the buttress root of a large living tree in dark jungle, the other at edge of thatch on a hut (W. H. S.).

Lygosoma (Leiolopisma) pulchrum Boulenger

Lygosoma pulchrum Boulenger, 1903, Proc. Zool. Soc. London, p. 127, pl. xii, fig. 3: Albert Edward Mountains at 6,000 feet, British New Guinea.

1 (M. C. Z. 49410) Aitape, A. N. G. (W. M. Beck) 1944.

Frontonasal as broad as long; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietal single; interparietal moderate; ear opening small; midbody scale rows 22 (24 in type); limbs pentadactyle; digits not dilated; subdigital lamellae more or less transversely enlarged; lamellae under fourth toe 21 (22 in type). Length 87+ (39 + 48+) mm.

The striking color pattern of the tail should render this species readily recognizable in the field.

Lygosoma (Leiolopisma) stanleyanum stanleyanum Boulenger

Lygosoma Stanleyanum Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 7, pl. i, fig. 2: Mount Victoria, Owen Stanley Mountains, British New Guinea.

1 (M. C. Z. 21000) Helwigg Mtns., D. N. G. (Amsterdam Mus.)1925.
27 (M. C. Z. 47083–96) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Frontonasal broader than long; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietal single; interparietal large; ear opening large; midbody scale rows 30–34 (only fourteen of Wilhelm series counted); limbs pentadactyle; digits not dilated; lamellae under fourth toe 21–27 (only fourteen of Wilhelm series counted).

The following supplementary data is derived from the fourteen catalogued specimens in the fine series from Mount Wilhelm, the supraciliary and labial counts are taken from the right side only. Prefrontals separated (in 11) or in contact (in 3); supraciliaries 6–8; upper labials 7, the fifth below the orbit (constant); lower labials 6–7; nuchals 1–3 pairs. Largest ♂ (M. C. Z. 47085), 151 (58 + 93) mm.; ♀ (M. C. Z. 47090), 129 (51 + 78) mm., but exceeded by several with head and body lengths of 52–57 mm. whose tails are regenerating.

The presence of a dorso-lateral series of buff dashes, frequently coalescing into a line which forms the upper edge of a dark lateral band, together with the absence of a white lateral line are characteristic aids to ready recognition. In life breeding males are apparently lemon-yellow on abdomen and beneath tail.

Lygosoma (Leiolopisma) stanleyanum morokanum (Parker)

Leiolopisma morokanum Parker, 1936, Ann. Mag. Nat. Hist. (10), **17**, p. 87: Moroka, British New Guinea.

2 (M. C. Z. 44199–200) Mt. Misim, A. N. G. (H. Stevens) 1933.

Midbody scale rows 28–30; lamellae under fourth toe 21–22; tip of fourth toe of adpressed hind limb reaches elbow of backward pressed forelimb. Larger measures 111 (52 + 59) mm.

In all other respects these two skinks agree with Parker's description of *morokanum* which he compares with *miotis*. Actually it is intermediate between that species and *stanleyanum* from which it differs only in the number of midbody scale rows 28–30, instead of 30–34.

Lygosoma (Leiolopisma) miotis Boulenger

Lygosoma miotis Boulenger, 1895, Ann. Mag. Nat. Hist. (6) **16**, p. 29: Ferguson and D'Entrecasteaux Islands, British New Guinea.

Lygosoma (Liolepisma) subnitens Boettger, 1896, Abhand. Ber. König. Zool. Mus. Dresden, **6**, No. 7, p. 2: Bongu, Astrolabe Bay, Australian New Guinea.

4 (M. C. Z. 49347–9) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
1 (M. C. Z. 49394) Toem, D. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 119182–3) Milne Bay, B. N. G. (J. F. Cassel) 1944.
1 (U. S. N. M. 119355) Gusiko, A. N. G. (W. H. Stickel) 1944.

Frontonasal as broad as, or broader than, long; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietal single: interparietal large; ear opening moderate; midbody scale rows 26; limbs pentadactyle; digits not dilated; subdigital lamellae more or less enlarged transversely; lamellae under fourth toe 15–21. Largest (M. C. Z. 49347), 91+ (43 + 48+) mm., but surpassed in head and body length of 54 mm. by the Toem skink.

Color in life of M. C. Z. 49394 as recorded by Stickel. Above, crown of head with a brassy tinge, otherwise gray flecked with black and cream. Below, white. As now preserved this specimen looks like gray lichen, being strikingly different from the striped individuals from elsewhere, though close scrutiny shows how the stripes disappeared.

As pointed out by its describer this skink closely resembles *noctua*, so closely in fact that the single frontoparietal appears to be the only distinguishing character. Parker (1936, p. 87) points out that the type actually has 26, not 24, midbody scale rows. Found on the pale-colored trunks of dead, but still standing, trees. Apparently rare at Toem as only one was seen by Stickel, though others were reported by Captain Edward J. Ross.

Lygosoma (Leiolopisma) fuscum beccarii (Peters & Doria)

Heteropus Beccarii Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 361: Tual, Kei Island, Dutch East Indies.

1 (M. C. Z. 33537) Kei Islands (R. Mertens) 1908.

Characters as in typical form but frontal equals length of frontoparietal and interparietal together, and midbody scale rows 40; lamellae beneath fourth toe 31. Length 131 (48 + 83) mm.

From the summary of data which follows the key to the forms of *fuscum* in New Guinea, it will be seen that both the typical form and more especially *L. f. luctuosum* occasionally (in 12 of 176 examined) possess the character formerly thought to separate *beccarii*, viz., length of frontal equal to that of the frontoparietal and interparietal together. As it also overlaps in the number of midbody scale rows I relegate *beccarii* to subspecific status.

Lygosoma (Leiolopisma) fuscum fuscum (Duméril & Bibron)

Heteropus fuscus Duméril & Bibron, 1839, Erpét. Gén., **5**, p. 579: "Ile de Waigiou," i.e. Waigeo Island, Dutch New Guinea (restricted).

Heteropus tricarinatus Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 133: Dore, Jobi Island, Dutch New Guinea.

1 (M. C. Z. 7309) Fakfak, D. N. G. (A. E. Pratt) 1907.
7 (M. C. Z. 7673) Saonek, D. N. G. (T. Barbour) 1907.
8 (M. C. Z. 7675) Sorong, D. N. G. (T. Barbour) 1907.
13 (M. C. Z. 7679) Manokwari, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 7684) Jende, D. N. G. (T. Barbour) 1907.
49 (M. C. Z. 49411–445) Toem, D. N. G. (W. H. Stickel) 1944.
3 (U. S. N. M. 40029–31) Saonek, D. N. G. (T. Barbour) 1907.
30 (U. S. N. M. 119305–34) Toem, D. N. G. (W. H. Stickel) 1944.

Frontonasal broader than long (only a few checked); supraoculars 4, the two anterior ones in contact with the frontal; frontal as long as, or longer than, the frontoparietal; frontoparietal single; interparietal very small, absent in M. C. Z. 49413; upper labials anterior to subocular 4, except on right side of M. C. Z. 7679 where there are 5; midbody scale rows 32–36, tricarinate; forelimb quadridactyle; digits not dilated at base; lamellae under fourth toe 25–31. Largest (both in M. C. Z. series 7673) 152 (53 + 99) mm., and 144 (60 + 84) mm.

Some of the specimens referred to *fuscum* by Barbour (1912, p. 93) have been transferred elsewhere, one Sorong skink to *L. novaeguineae*, the Ansoes lizard to *Emoia iridescens*, the Pom specimen to *Emoia tropidolepis*, while the Jamna Island reptile appears to represent an undescribed insular subspecies. Otherwise, judging from my examination of the material, and as indicated by the data furnished below, there seems to be no structural grounds for recognizing races, but the coloration is sufficiently different to warrant recognition of an eastern form as discussed under *L. f. luctuosum*.

One of these skinks was recovered from the stomach of a tree snake (*Ahaetulla c. schlenkeri*).

Lygosoma (Leiolopisma) fuscum luctuosum (Peters & Doria)

Heteropus luctuosus Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 364: Mount Epa, British New Guinea.

Lygosoma atrigulare Ogilby, 1890, Rec. Australian Mus., **1**, p. 94: St. John's River District, British New Guinea.

Lygosoma nigrigulare Boulenger, 1897, Ann. Mus. Civ. Stor. Nat. Genova, (2), **18**, p. 700, pl. vii, fig. 3: Inawi, British New Guinea.

Leiolepisma pullum Barbour, 1911, Proc. Biol. Soc. Washington, **24**, p. 15. Humboldt Bay, Dutch New Guinea.

Leiolepisma fuscum diguliense Kopstein, 1926, Zool. Medel., **9**, p. 88: Assike, Upper Digul River, Dutch New Guinea.

1 (M. C. Z. 4711) New Britain Arch. (Mus. Godeffroy) 1882.
1 (M. C. Z. 7486) Humboldt Bay, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 22907–8) Merauke, D. N. G. (P. T. L. Putnam) 1927.
6 (M. C. Z. 38977–81) Assike, D. N. G. (F. Kopstein) 1923.
9 (M. C. Z. 48581–3) Aitape, A. N. G. (W. M. Beck) 1944.
41 (M. C. Z. 39352–81) Gusiko, A. N. G. (W. H. Stickel) 1944.
2 (M. C. Z. 49390–1) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
5 (U. S. N. M. 119184–8) Milne Bay, B. N. G. (J. F. Cassel) 1944.
3 (U. S. N. M. 119259–61) Finschhafen, A. N. G. (W. H. Stickel) 1944.
41 (U. S. N. M. 119262–302) Gusiko, A. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 119303–4) Hollandia, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 120353) Milne Bay, B. N. G. (G. H. Bick) 1944.

while the undermentioned represent the aberration *nigrigulare*

1 (M. C. Z. 47097) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.
7 (M. C. Z. 49382–7) Gusiko, A. N. G. (W. H. Stickel) 1944.
2 (M. C. Z. 49388–9) Aitape, A. N. G. (W. M. Beck) 1944.

together with one or two others in the U. S. N. M. Gusiko series.

The New Britain specimen listed above, being fully adult, is arbitrarily assigned to *luctuosum*. Whether some older name than *luctuosum* is available for this eastern race appears doubtful. *L. leucotaenia* Bleeker, 1860, of Ceram, to judge by our Ceram material, represents still another race.

Frontonasal broader than long (only a few checked); supraoculars 4, the two anterior ones in contact with the frontal; frontal shorter than, as long as, or longer than, the frontoparietal; frontoparietal single; interparietal, when present, very small; upper labials anterior to suboocular 4, except on left side of head in M. C. Z. 38981 where there are 3; midbody scale rows 32–37; forelimb quadridactyle; digits not dilated at base; lamellae under fourth toe 25–33. Largest, a ♂ (U. S. N. M. 119303), 163 (61 + 102) mm., but surpassed in tail length by ♂ (M. C. Z. 49352), of 164 (59 + 105) mm.

Boulenger, when describing *nigrigulare*, remarked on its similarity to *fuscum* of which he also had specimens from Inawi. It will be noted that we have both types from Gusiko and Aitape with nothing to distinguish them except the fusion of interparietal with frontoparietal, while intermediates are not uncommon in the larger series. In the typical form the only individual lacking an interparietal appears to

have lost it to the parietals rather than by fusion with the frontoparietal.

The synonymizing of *pullum* may appear strange in view of the holotype (M. C. Z. 7486) being said to have 42 midbody scale rows, actually it has but 36 as I have verified by half a dozen counts. Furthermore, the number of lamellae under the fourth toe is the same on either hind foot, viz. 29, not 32, while the total length is 130 (48 + 82) mm., so that the tail is not "almost exactly twice as long as head and body." The color description, and subsequently published colored plate (Barbour, 1912, pl. ii, fig. 3) of this abnormal individual, however, leave no room for doubt that M. C. Z. 7486 is the actual holotype. Stickel's two specimens from Hollandia, also in Humboldt Bay, are quite normal.

Lygosoma (Leiolopisma) fuscum jamnanum subsp. nov.

Leiolepisma fuscum Barbour (part), 1912, Mem. Mus. Comp. Zoöl., **44**, p. 93: "Djamna, Papua."

Holotype. Museum of Comparative Zoölogy, No. 7677, a ♀ from Jamna Island, Dutch New Guinea, collected by Thomas Barbour,1907.

Diagnosis. Characters those of the typical form from which it differs only in having 29 (or 28) midbody scale rows instead of 32–36 (for over one hundred specimens counted). Lamellae under fourth toe 27. Length from snout to anus 46 mm., tail missing.

Differs from *novaeguineae* Meyer in its larger size, anteriorly pointed (not truncate) frontal, longer digits, and different coloring. See also following key, while from remarks made under typical *fusca* it will be noted that color pattern furnishes the only basis on which to separate an eastern race on the main island.

Key to the New Guinean races of fuscum

1. Midbody scale rows 29 (? 28–30); range: Jamna (Djamna) Island, Dutch New Guinea ..... *f. jamnanum*
   Midbody scale rows 32–40 2
2. Frontal usually not longer than frontoparietal; midbody scale rows 32–38.
   Flanks of young resemble those of adults in being more or less uniform olive-brown with or without paler flecks; range: New Guinea west of 139° E., with young skinks from Toem showing some traces of lateral markings ..... *f. fuscum*

SUMMARY OF DATA OF RACES FOUND IN THE NEW GUINEA REGION

Lygosoma (Leiolopisma) fuscum

	East longitude	Localities	Specimens examined	Maximum length in mm. for		Midbody scale-rows	Lamellae on Fourth toe	Frontal in relation to frontoparietal			
				H. & B.	Tail			shorter than	as long as	longer than	as long as frontoparietal and interparietal
L. f. jamnanum	139°15′ E.	Jamna Id.*	1	46	–	28 or 29	27		1		
L. fuscum fuscum	130°35′ E.	Waigeo Id.*									
	130°35′ E.	Saonek	10	60	99	32–34	26–31		6	4	1
	131°15′ E.	Sorong	8	57	98	34–36	26–29		5	3	
	132°15′ E.	Fakfak	1	48	–	34	28		1		
	134°05′ E.	Manokwari	13	58	96	32–34–36	25–31		12	1	
	134°30′ E.	Jende, Roon	2	55	84	32–34	26–28		2	1	
	136°10′ E.	Dore, Jobi*									
	139°00′ E.	Toem	59	60	98	32–34–36	25–32	9	47	3	
L. f. luctuosum	140°15′ E.	Asike*	6	47	64	32–33	26–29	3	2	1	
	140°20′ E.	Merauke	2	48	62	32	25–30	2			
	140°45′ E.	Humboldt B.*	1	47	83	36	29		1		
	140°45′ E.	Hollandia	2	61	102	33–34	27–29		2		
	142°25′ E.	Aitape	1	52	80	32–34–36	26–31	1	8		
	146°35′ E.	Inawi*									
	146°45′ E.	Mount Epa*									
	147°50′ E.	Gusiko	60	59	105	32–34–37	26–33	1	44	8	7
	147°50′ E.	Finschhafen	5	61	84	32–34	25–33		1	1	3
	150°30′ E.	Milne Bay	6	56	86	32–34	28–32		3	2	1
L. f. beccarii	ca.132° E.	Kei Islands	1	48	85	40	31				1

*Type Locality

Flanks of young display a broad black lateral band edged above and below with white (in addition to a pair of light lines on dorsum), these markings breaking up and disappearing with age though occasionally persisting in varying degrees in adults which, except for the absence of paler flecks, are very similar to the typical form; range: New Guinea east of 140° E.
f. luctuosum

Frontal usually as long as frontoparietal and interparietal together; midbody scale rows 38–40.

Flanks of adult colored much like those of juvenile *luctuosum* and flecked with lighter while the olive-brown dorsum has both light and black flecks; range: Kei Islands (i.e. between 5° and 6° S., 131°50, and 133°15, E.) ..... *f. beccarii*

Lygosoma (Leiolopisma) bicarinatum (Macleay)

Heteropus bicarinatus Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 68: Hall Sound, British New Guinea.

Heteropus Albertisii Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 362: Yule Island, British New Guinea.

1 (U. S. N. M. 117563) Near Port Moresby, B. N. G. (J. E. Hadley) 1944.

Frontonasal broader than long; supraoculars 4, the two foremost in contact with the frontal; frontoparietal single; interparietal large; midbody scale rows 30, bicarinate; forelimbs quadridactyle, digits not dilated; subdigital lamellae transversely enlarged; lamellae under fourth toe 28. Length 93 (40 + 53) mm. Taken seven miles from the Port; condition poor.

Lygosoma (Leiolopisma) novaeguineae Meyer

Lygosoma (Carlia) Novae Guineae Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 132: (Dutch) New Guinea.

Lygosoma curtum Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 9: Mount Victoria, Owen Stanley Mountains, British New Guinea.

1 (M. C. Z. 21065) "Kloofbivak," D. N. G. (Amsterdam Mus.) 1925.
1 (M. C. Z. 49392) Sorong, D. N. G. (T. Barbour) 1907.

Frontonasal broader than long; supraoculars 4, the two anterior ones in contact with the frontal; frontoparietals single; interparietal large; midbody scale rows 24; forelimbs quadridactyle; digits not

dilated; subdigital lamellae transversely enlarged; lamellae under fourth toe 24 (and uncountable). Larger (M. C. Z. 49392), 63+ (35 + 28+) mm., tail regenerating. The Sorong lizard was reregistered from M. C. Z. 7676, a series of *L.* (*L.*) *f. fuscum* Duméril & Bibron.

EMOIA

The making of a major division in Boulenger's (1887, p. 219) key to this group, based on whether there were more than, or less than, 40 lamellae under the fourth toe was unfortunate in view of the fact that five of our eight New Guinean representatives of the genus would come under both sections. This division may in part have been responsible for the describing of *mivarti* which is here considered a synonym of *b. baudinii.*

Even less fortunate was de Rooij's (1915, pp. 246–247) key based on whether the ear opening was "as large as," or "slightly larger than," the palpebral disk. Another unstable character utilized by both authors depended on whether the frontoparietal and interparietal were distinct or fused, a matter dealt with under *cyanogaster* and other species.

Emoia cyanogaster (Lesson)

Scincus cyanogaster Lesson, 1830, Zool., in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 47, pl. iii, fig. 3: "Oualan," = Kusaie Island, Caroline Islands.

Lygosoma iridescens Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 9, pl. i, fig. 4: Mount Victoria, Owen Stanley Mountains, British New Guinea.

Lygosoma cyanogaster keiensis Sternfeld, 1921 (1920), Abhand. Senckenberg. Naturf. Ges., **36**, p. 405: Langgur, Kei Islands.

Lygosoma cyanogaster aruensis Sternfeld, 1921 (1920), Abhand. Senckenberg. Naturf. Ges., **36**, p. 405: Papakula, Kobroor Island, Aru Islands.

1 (M. C. Z. 4712) New Britain (Mus. Godeffroy) 1882.
1 (M. C. Z. 7683) Ansoes, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7688) Wooi Bay, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7689) Sorong, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 48603) Aitape, A. N. G. (W. M. Beck) 1944.
2 (M. C. Z. 49317) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 75974) Wooi Bay, D. N. G. (T. Barbour) 1907.
1 (U. S. N. M. 118826) Finschhafen, A. N. G. (A. M. Keefe) 1944.
5 (U. S. N. M. 119398, 119416, 119425–7) Gusiko, A. N. G. (W. H. Stickel) 1944.

Prefrontal much shorter than frontal; frontoparietal slightly longer than, or as long as, broad; frontoparietal fused with interparietal, *or interparietal distinct;* midbody scale rows 24–28; lamellae under fourth toe 66–90. Largest (U. S. N. M. 79574), 283 (95 + 188) mm.

Color in life of a Toem skink as recorded by Stickel. Above, metallic green and bronze mixed and mottled on head; neck and shoulders metallic green; hinder half of body and base of tail bronze underlain by green, rest of tail mostly light bronze; stripe on side of neck brownish; flanks bronzy green; forelimbs as head; hind limbs bronze with green tinge. Below, chin and throat pale greenish yellow; belly bright yellowish green mesially, bluish green towards sides; preanal region and vicinity of hind legs bright greenish yellow; palms and soles brown; fingers and toes black; base of tail bright greenish yellow, remainder dull white and light bronze.

One of the Toem specimens of this arboreal skink was taken at light in a tent on the night of August 28 (W. H. S.). The Ansoes skink (M. C. Z. 7683) listed above was referred to *L. fuscum* by Barbour (1912, p. 93).

It does not seem possible to regard *iridescens* as distinct, even as a race, for specimens with and without fused interparietals occur at Wooi Bay, Toem, and Gusiko, so that the case seems to parallel that involving *Lygosoma* (*Leiolopisma*) *fuscum luctuosum* (in which frontoparietal and interparietal are distinct) and the variety *nigrigulare* (in which they are fused). Nor do there seem to be grounds for recognizing the two races — *keiensis* and *aruensis* — proposed, without diagnosis, by Sternfeld.

Emoa cuneiceps de Vis (1890, p. 498) from St. Joseph's River, British New Guinea, agrees in every respect with *cyanogaster* except in the number of midbody scale rows, said to be 33–36 (? possibly a misprint for 23–26).

Emoia cyanura (Lesson)

Scincus cyanurus Lesson, 1830, Zool. in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 49, pl. iv, fig. 2: Tahiti, Society Islands.

Eumeces lessonii Duméril & Bibron, 1839, Erpét. Gén., **5**, p. 654: substitute name for *cyanurus* Lesson.

Lygosoma (*Emoa*) *impar* Werner, 1898, Zool. Anz., **21**, p. 553: Ralum and Mioko Islands, New Britain Archipelago.

2 (M. C. Z. 4708) New Britain Arch. (Mus. Godeffroy) 1882.

Prefrontal much shorter than the frontal; frontoparietal as long as,

or slightly longer than, broad, fused with the interparietal; midbody scale rows 28–29; lamellae under fourth toe 55–60. Larger skink, 116+ (49 + 67+) mm.

For comments on New Guinean "*cyanura*" (auct.) see *Emoia caeruleocauda* below.

Emoia caeruleocauda de Vis

Mocoa caeruleocauda de Vis, 1892, Ann. Queensland Mus., No. 2, p. 12: "Sudest" = Tagula Island, British New Guinea.

Lygosoma cyanurum werneri Vogt, 1912, Sitzb. Ges. Naturf. Freunde Berlin, p. 5: Mariana or Ladrone Islands.

Lygosoma werneri triviale Schüz, 1929, Abhand. Ber. Zool. Mus. Dresden, (2), **17**, p. 8: Dore, Jobi Island, Dutch New Guinea.

4 (M. C. Z. 7647) Pom, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7648) Jamna Id., D. N. G. (T. Barbour) 1907.
11 (M. C. Z. 7649) Wooi Bay, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7653) Saonek, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 7654) Ansoes, D. N. G. (T. Barbour) 1907.
4 (M. C. Z. 42153–6) Kokoda, D. N. G. (Brit. Mus.) 1936.
2 (M. C. Z. 44195–6) Wau, A. N. G. (H. Stevens) 1933.
8 (M. C. Z. 48599–602) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49247) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
11 (M. C. Z. 49301–9) Liki Id., D. N. G. (W. H. Stickel) 1944.
2 (M. C. Z. 49310–1) Toem, D. N. G. (W. H. Stickel) 1944.
2 (U. S. N. M. 40035–6) Wooi Bay, D. N. G. (T. Barbour) 1944.
1 (U. S. N. M. 118827) Finschhafen, A. N. G. (A. M. Keefe) 1944.
1 (U. S. N. M. 119418) Finschhafen, A. N. G. (W. H. Stickel) 1944.
4 (U. S. N. M. 119419–22) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119423) Hollandia, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119424) Toem, D. N. G. (W. H. Stickel) 1944.
9 (U. S. N. M. 119534–42) Gamadodo, B. N. G. (G. H. Penn) 1944.
4 (U. S. N. M. 120102–5) Amsterdam Id., D. N. G. (G. H. Penn) 1944.
2 (U. S. N. M. 122106–7) Near Finschhafen, A. N. G. (J. E. Hadley) 1944.

For the first two characters mentioned below, only a representative selection of skinks were examined.

Prefrontals shorter than the frontal; frontoparietal as long as, or slightly longer than, broad, fused with the interparietal; midbody scale rows 26–34, average 30.5 for seventy-one specimens; lamellae under fourth toe 31–50, average 40.5 for seventy-one specimens. Largest (M. C. Z. 7654), 140 (50 + 90) mm., and (U. S. N. M. 119535), 140 (55 + 85) mm.

Color in life of U. S. N. M. 119418–9 as recorded by Stickel. Above, head and body black with yellow stripes; tail blue (but not so in some others). Below, chin and throat greenish blue; belly iridescent. So closely do the striking markings of this skink resemble those of *cyanura* that I would have treated it as a subspecies had not Mr. W. C. Brown of Stanford invited my attention to the fact that both occur together on some islands of the Solomon group without apparent overlapping of characters.

Stickel failed to find this species in the jungle, but it was common among the brush and grass of the sandy coastal plain; some specimens were in drift trash. One was found on the rocky base of an islet 150 yards from Pie Beach, with which it was connected at low tide by a wet gravel flat interspersed with tidal pools. Except for the rocks and cliffs around its base, the islet carried a dense growth of vegetation. One skink was recovered from the stomach of a young boa (*Enygrus carinatus*).

Emoia baudinii baudinii (Duméril & Bibron)

Eumeces Baudinii Duméril & Bibron, 1839, Erpét. Gén., **5**, p. 653: New Guinea.

Euprepes Physicae Duméril & Bibron, 1839, Erpét. Gén., **5**, p. 688: New Guinea.

Lygosoma mivarti Boulenger (part ?), 1887, Cat. Lizards Brit. Mus., **3**, p. 292, pl. xxiii, fig. 1: Wild Island, Admiralty Islands.

1 (M. C. Z. 42157) Kokoda, B. N. G. (Brit. Mus.) 1936.
2 (M. C. Z. 48604) Aitape, A. N. G. (W. M. Beck) 1944.
1 (U. S. N. M. 119189) Milne Bay, B. N. G. (J. F. Cassel) 1944.
50 (U. S. N. M. 119364–97, 119399–403, 119405–15) Gusiko, A. N. G. (W. H. Stickel) 1944.

For the first two characters and scale counts mentioned below, of the Gusiko series only 15 skinks were examined.

Prefrontals much shorter than the frontal; frontoparietals as long as, or slightly shorter than, broad, fused with the interparietal; midbody scale rows 36–40, average 38 for eighteen skinks; lamellae under fourth toe 37–45, average 40.3 for seventeen skinks. Largest (U. S. N. M. 119368), 154 (57 + 97) mm., but exceeded by 2 mm. in head and body length of U. S. N. M. 119405.

Color in life of a gravid ♀ (U. S. N. M. 119367) as recorded by Stickel. Above, head and neck olive bronze edged with olive gold; eyelids edged with gold; an olive vertebral stripe, flanked by a mottled

brown stripe, bordered by a weak olive stripe, below which is a broad black band on flank that becomes reddish brown on side of neck to eye; from the ear commences a narrow stripe that is tan on the neck but changes to light metallic green on the flank where it extends from axilla to groin cutting through the broad black lateral band a little of which is seen below fading into the belly coloring; limbs olive, spotted with black; base of tail gray brown edged with black, below which it is brown on sides, the posterior two-thirds wholly gray brown. Below, chin and throat tinged with green; belly an iridescent bluish slate; limbs slate; tail mottled slate and gray.

Variations from this type of coloration were also noted by Stickel. Indeed, were it not for the fact that individuals with sharply defined vertebral and lateral stripes occur alongside those lacking the vertebral stripe together with intermediates, they might well be thought to be distinct.

Stickel found this skink living "on or near large blocks of vegetated coral rock but not on the sea cliffs." From our material it would appear that typical *baudinii* is the form occupying the littoral in eastern Guinea, while its subspecies *pallidiceps* (with fewer midbody scale rows) occurs on higher ground (1,000 to 10,000 feet) in the interior, except that in western Guinea it is also to be found in the coastal belt.

I cannot see any reason for regarding *mivarti* as distinct, but it would be interesting to have confirmation of Boulenger's lowest count of 34 midbody scale rows which would indicate a tendency towards *pallidiceps* comparable to that shown by *pallidiceps* occasionally exhibiting 36 midbody scale rows.

Emoia baudinii pallidiceps Vis

? *Euprepes* (*Tiliqua*) *callistictus* Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 355: Sorong, Dutch New Guinea.

Emoa pallidiceps de Vis, 1890, Proc. Linn. Soc. N. S. W. (2), **5**, p. 497: St. Joseph's River, British New Guinea.

Lygosoma Méhelyi Werner, 1899, Zool. Anz., **22**, p. 371: "Friederich-Wilhelmshaven" = Madang, Australian New Guinea.

Lygosoma jakati Kopstein, 1926, Zool. Meded., **9**, p. 94: Jakati River, "Bintuni" = Bentoni Bay, Dutch New Guinea.

Lygosoma mivarti var. *obscurum* de Jong, 1927, Novae Guinea, **15**, p. 317: Pionierbivak, Mamberamo River, Dutch New Guinea (restricted).

28 (M. C. Z. 7661) Jamna Id., D. N. G. (T. Barbour) 1907.
14 (M. C. Z. 7662) Sorong, D. N. G. (T. Barbour) 1907.

8 (M. C. Z. 7664, 7695) Manokwari, D. N. G. (T. Barbour) 1907.
3 (M. C. Z. 7665) Pom, D. N. G. (T. Barbour) 1907.
5 (M. C. Z. 7666, 7694) Wooi Bay, D. N. G. (T. Barbour) 1907.
4 (M. C. Z. 7693) Ansoes, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 19606) Lake Sentani, D. N. G. (Basel Mus.) 1924.
1 (M. C. Z. 19608) Central D. N. G. (Basel Mus.) 1924.
5 (M. C. Z. 44192–4) Wau, B. N. G. (H. Stevens) 1933.
3 (M. C. Z. 47098–100) Mt. Wilhelm, A. N. G. (P. J. D.) 1944.
8 (M. C. Z. 49318–25) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 40024) Wooi Bay, D. N. G. (T. Barbour) 1907.
3 (U. S. N. M. 40032–4) Jamna Id., D. N. G. (T. Barbour) 1907.
1 (U. S. N. M. 58505) Sorong, D. N. G. (J. Hurter) 190 ?
1 (U. S. N. M. 75973) Manokwari, D. N. G. (T. Barbour) 1907.
5 (U. S. N. M. 124640–4) Toem, D. N. G. (W. H. Stickel) 1944.

Prefrontals much shorter than the frontal; frontoparietal as long as, or slightly longer than, broad, fused with the interparietal; midbody scale rows 30–34, rarely 36, average 32.9 for sixty-four skinks; lamellae under fourth toe 25–48, average 34 for sixty-four skinks. Largest ♂ (M. C. Z. 47098), 145 (55 + 90) mm., and ♀ (M. C. Z. 47099), 142 (55 + 77) mm., both surpassed by the type of 150 (50 + 100) mm., *fide* de Vis.

Except that they have not got 28 midbody scale rows, our Sorong specimens agree so closely with the description of *callistictus* from Sorong that I am inclined to think a recount of the type would reveal it as having 30. In that event *callistictus* would have precedence over *pallidiceps*.

Much confusion has existed between *pallidiceps* and typical *baudinii* owing to both forms exhibiting two color phases. Barbour (1912, p. 94) referred those (M. C. Z. 7661–6) with a pale vertebral and four dorsolateral white lines to *mivarti*, and others (M. C. Z. 7693–5), in which the lines were absent, to *baudinii*, both phases occurring at Manokwari and Wooi Bay. When I found both occurring also on Mount Wilhelm and noted that these striking color phases possess identical scale counts and squamation, there seemed no reasonable grounds to treat them as distinct.

I regard *pallidiceps* as a race of *baudinii*, whose color pattern exhibits corresponding variation, because both forms may have 36 midbody scale rows though so high a number is rare in *pallidiceps* as it was found in only four (one each from Jamna, Ansoes, Wau and Mount Wilhelm) of the sixty-four specimens counted.

L. mehelyi was said to lack auricular lobules, a condition to be found in M. C. Z. 7695 and other occasional specimens. *L. jakati*

was compared with "*mivarti*," i.e. *b. baudinii*, as was de Jong's *L. mivarti* var. *obscurum*. The coloration, on which alone this "variety" was based, is characteristic of young *b. baudinii* and persists in later life in some adults of *b. pallidiceps* as our series shows.

I might add that when a light vertebral stripe is present it differs from that of *Emoia caeruleocauda* de Vis by broadening in the nuchal region to occupy two full scales, instead of two half-scales as in *caerulcocauda* which also differs in possessing a more pointed snout.

Emoia tropidolepis (Boulenger)

Lygosoma tropidolepis Boulenger, 1914, Trans. Zool. Soc. London, **20**, p. 260, pl. xxix, fig. 4: Mimika River, Dutch New Guinea.

1 (M. C. Z. 7682) Pom, Jobi Id., D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 21001) Bivak Id., D. N. G. (Amsterdam Mus.) 1925.
1 (M. C. Z. 44191) Wau, A. N. G. (H. Stevens) 1933.
1 (U. S. N. M. 119404) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119417) Toem, D. N. G. (W. H. Stickel) 1944.

Prefrontal much shorter than the frontal; frontoparietal as long as, or slightly longer than, broad, fused with the interparietal; midbody scale rows 36–40, keeled; lamellae under fourth toe 34–41. Largest (U. S. N. M. 119404), 169 (55 + 114) mm., and (M. C. Z. 21001), 161+ (70 + 91+) mm., tail reproduced.

The skink from Pom, being without stripes, has a superficial resemblance to *L.* (*Leiolopisma*) *fuscum* to which it was referred by Barbour (1912, p. 93). The Toem specimen was taken by Stickel during clearing of dense secondary growth composed of bananas, breadfruit, coconuts and spiny palms about four to five hundred yards from the seashore.

Emoia atrocostata irrorata (Macleay)

Mabouia irrorata Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 66: Hall Sound, British New Guinea.

1 (M. C. Z. 7696) Ansoes, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 7698) Sorong, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7699) Saonek, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 7700) Wooi Bay, D. N. G. (T. Barbour) 1907.
1 (U. S. N. M. 58504) Jobi Id., D. N. G. (J. Hurter) 1907.
1 (U. S. N. M. 120108) Dracger Harbor, A. N. G. (G. H. Penn) 1944.

Prefrontal included once and two-thirds (once and a half in duplicate of M. C. Z. 7700 only)times in the length of the frontal; frontoparietal as broad as, or slightly broader than, long (broken up into three scales in M. C. Z. 7700); interparietal distinct; midbody scale rows 34–39; lamellae under fourth toe 32–38. Largest (M. C. Z. 7699) 175+ (70 + 105+) mm., tail regenerated, but slightly surpassed in head and body length by two others.

The first half-dozen specimens listed above were referred by Barbour (1912, p. 94) to *atrocostatum* (Lesson) of "Oualan" = Kusaie Island in the Carolines. However, they differ from our Caroline material (M. C. Z. 22073–5) from Ponape Island in possessing a noticeably larger mental. The entire group of associated species appears in need of revision but it would seem that *boettgeri* (Sternfeld, 1921) of the Carolines is a synonym of the typical form. Solomons material, which has a larger ear opening, is usually referred to *E. a. nigrum* (Hombron & Jacquinot), though the type locality of *nigrum* was unknown. *E. a. parietalis* (Peters, 1871), with shorter prefrontals, is a western race while the dusky-throated skinks of the Philippines, for which the names *bitaeniata* ((Peters, 1864), *cumingii* (Peters, 1867), and *microsticta* (Peters, 1874) are available appear intermediate between *atrocostata* and *parietalis* but nearer to the latter.

Ablepharus boutonii novaeguineae (Mertens)

Cryptoblepharus boutonii novae-guineae Mertens, 1928, Zool. Anz., **78**, p. 87: Mamberamo, Dutch New Guinea.

3 (M. C. Z. 7484) Saonek, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7671) Wooi Bay, D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 7672) British New Guinea (T. Barbour) 1907.
1 (M. C. Z. 49300) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 29415) Port Moresby, B. N. G. (Karcher)
2 (U. S. N. M. 119484–5) Gusiko, A. N. G. (W. H. Stickel) 1944.

Frontal not half the size of the shield formed by fusion of frontoparietals with interparietal; upper eyelid represented by 3–5 (3–5 in Saonek series alone, 3 elsewhere) large scales; midbody scale rows 22–26; fingers and toes 5. Largest (M. C. Z. 49300), 81 (38 + 43) mm., but surpassed in head and body length by four others of 42 mm.

Color in life as recorded by Stickel. Above, head metallic bronze with rosy tinge; (and for U. S. N. M. 119484) back and dorsolateral stripe light gray with metallic reddish gold tinge. Below, belly grayish white with iridescent sheen.

The Liki Island skink may represent yet another race but without a series it would be unwise to name it. The back is flecked with darker and quite devoid of stripes, the frontal is small and very narrow and the head also is narrower than is the case with most of the others listed.

Ablepharus boutonii keinensis Roux

Ablepharus boutoni var. *keiensis* Roux, 1910, Abhand. Senckenberg. Naturf. Ges., **33**, p. 240, pl. xiii, fig. 3: Elat, Kei-Dulah, etc., Great Kei Island, Kei Islands.

1 (M. C. Z. 29162) Elat, Kei Is. (Senckenberg Mus.) 1929.
1 (M. C. Z. 29163) Kei-Dulah, Kei Is. (Senck. Mus.) 1929.

These two skinks, being cotypes, conform to the redescription and figures of this race given by Mertens (1931, p. 147, pl. ii, fig. 18) in his monograph of the species.

PYGOPODIDAE

Lialis jicari Boulenger

Lialis jicari Boulenger, 1903, Ann. Mag. Nat. Hist. (7), **12**, p. 430: Fly River, British New Guinea.

1 (M. C. Z. 19723) Lababia, A. N. G. (Brit. Mus.) 1924.
2 (M. C. Z. 48571–2) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49395) Port Moresby, B. N. G. (C. W. Moren) 1944.
1 (U. S. N. M. 119258) Toem, D. N. G. (W. H. Stickel) 1944.

Tip of snout truncate; upper labials 16–21; lower labials 18–20; midbody scale rows 22; preanal pores 6–8. Largest (M. C. Z. 19723), 650+ (310 + 340+) mm., tail reproduced. The Toem scale-foot was secured by Stickel following bulldozers clearing jungle growth on moist, loose, rather sandy, reddish soil.

VARANIDAE

Varanus indicus indicus (Daudin)

Tupinambis indicus Daudin, 1802, Hist. Nat. Rept., **3**, p. 46, pl. xxx: Amboina Island, Molucca Islands.

Monitor douarrha Lesson, 1830, Zool., in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 53: Praslin Bay, New Ireland.

Monitor chlorostigma Gray, 1831, in Griffith, Anim. Kingdom, **9**, Synops., p. 26: Rawack Island, north of Waigeo Island, Dutch New Guinea.

Monitor doreanus Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 130: Dore, Jobi Island, Dutch New Guinea.

Varanus indicus rouxi Mertens, 1926, Senckenbergiana, **8**, p. 276: Durdjela, Wammer, Aru Islands.

Varanus indicus jobiensis Ahl, 1932, Mitt. Zool. Mus. Berlin, **17**, p. 892: Jobi = Japen Island, Dutch New Guinea.

1 (M. C. Z. 7488) Aru Islands (A. E. Pratt) 1911.
2 (M. C. Z. 44186–7) Wau, A. N. G. (H. Stevens) 1933.
1 (M. C. Z. 48573) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49282) Toem, D. N. G. (W. H. Stickel) 1944.
1 (M. C. Z. 49283) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119547) Gusiko, A. N. G. (W. H. Stickel) 1944.

Nostril round (M. C. Z. 48573) or oval (rest of series), slightly nearer end of snout than eye; median series of supraoculars transversely enlarged; nuchals not spinose; dorsals smooth (M. C. Z. 48573; 44186), very obtusely keeled (M. C. Z. 7488) , or keeled (rest); midbody scale rows 125–176 (M. C. Z. 49283–49282), the ventrals smooth, or obtusely keeled in adults; tail with a very low, double-toothed crest (not distinguishable in juveniles), strongly compressed except on basal quarter. Largest skinned out; next (M. C. Z. 49282), 770 (300 + 470) mm., another (M. C. Z. 48573), 715 (265 + 450) mm.

Color above, blackish with clearly marked ocelli (M. C. Z. 44187; 48573), spotted (M. C. Z. 44186; 48573) or flecked (rest) with yellow, or (*fide* Stickel) blue on distal half of tail (M. C. Z. 49282). Two of the most easterly monitors (M. C. Z. 44186; 48573) have smoother scales and larger spots or ocelli than the western, with the exception of an ocellate juvenile. Mertens (1942, pp. 260–272) remarks on the extreme variability of the species and the doubtful validity of *V. i. kalabeck* (Lesson, 1830), with one or other of whose characters some of these monitors conform.

The Toem specimen was "shot in jungle near a small stream" (W. H. S.). Ticks were present on several.

Varanus prasinus beccarii (Doria)

Monitor beccarii Doria, 1874, Ann. Mus. Civ. Stor. Nat. Genova, **6**, p. 331, pl. xi, fig. a: "Wokan," i.e. Wokam Island, Aru Islands.

2 (M. C. Z. 7489) Aru Islands (A. E. Pratt) 1911.

Nostril round; median series of supraoculars transversely enlarged; nuchal scales strongly keeled; tail without crest, slightly compressed posteriorly; color black. Larger, 845 (295 + 550) mm. In size this fine topotype surpasses the type and largest known specimen recorded by Mertens (1942, p. 294). These two monitors were presented by Barbour who (1912, pp. 89 and 183) referred them to *V. kordensis* (part).

SERPENTES

TYPHLOPIDAE

Typhlops erycinus Werner

Typhlops erycinus Werner, 1901, Verh. Zool. Bot. Ges. Wien, **51**, p. 611: Australian New Guinea.

3 (M. C. Z. 49396, 49619–20) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 118823) Finschhafen, A. N. G. (A. M. Keefe) 1944.
7 (U. S. N. M. 119488, 119491–96) Toem, D. N. G. (W. H. Stickel) 1944.

Rostral nearly a third the width of head, not extending to the level of the eyes; nasal completely divided, the cleft proceeding from the first labial; preocular in contact with second and third labials; no subocular; midbody scale rows 20; diameter into total length 27–32 (44 in type which was much larger than any in this series); tail into total length of *presumed* males 12–19 times, in *presumed* females 22–28 times. Largest (U. S. N. M. 119488), 297 (286 + 11) mm.

Color in life of U. S. N. M. 119488 as recorded by Stickel. Snout light lavender slightly tinged with pinkish orange; preocular and ocular purplish; back dull brown. Below, semi-transparent dull white.

Most of these blind snakes were turned up by bulldozers working in loose, reddish, rather sandy soil; one was taken in a heap of humus and decomposing vegetation, another was found dead on road. This species succumbs very slowly to strong ether vapor. (W. H. S.)

BOIDAE

Bothrochilus boa (Schlegel)

Tortrix boa Schlegel, 1837, Essai Phys. Serp., **2**, p. 22: New Ireland.

1 (M. C. Z. 20946) New Britain Archipelago (Exch. F. Werner) 1925.
1 (M. C. Z. 26939) Tusel, Duke of York Id. (Vienna Mus.) 1928.
1 (M. C. Z. 26940) Port Weber, New Britain (Vienna Mus.) 1928.

Midbody scale rows 37–38, smooth; ventrals 253–257; anal 1; subcaudals 49–52, paired and single. Largest, a ♂ (M. C. Z. 26939), 1045 (1010 + 35) mm. The habits of this python, long known as *Nardoa* or *Nardoana*, should be interesting for its body is strongly compressed and as strikingly ringed as that of a sea snake.

Liasis fuscus albertisii Peters & Doria

Liasis Albertisii Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 401, pl. iii, figs. 2a–d: "Kapaor" = Kapar and Andai, Dutch New Guinea.

Leiopython gracilis Hubrecht, 1879, Notes Leyden Mus., **1**, p. 15: "Salwatti" = Salawati Island, Dutch New Guinea.

♂ (M. C. Z. 48614) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (M. C. Z. 49397) Toem, D. N. G. (W. H. Stickel) 1944.
♀ (U. S. N. M. 118950) Finschhafen, A. N. G. (A. M. Keefe) 1944.

Rostral pitted (except for Toem snake which appears to have been kept in captivity and developed canker, for its regenerated rostral is not pitted); 1 pair of prefrontals; parietals bordered by small shields; upper labials 12–13, first 6 pitted; lower labials 15–16, median 7 pitted; midbody scale rows 47–49; ventrals 267–279; anal 1; subcaudals 73–75. Larger ♂ (M. C. Z. 48614), 1253 (1082 + 171) mm., ♀ (U. S. N. M. 118950), 1742+ (1540 + 202+) mm.

Color in life of Toem python as recorded by Stickel. Above, head black; eye dark grayish brown; whitish flecks behind eyes; lips black and white; body and tail iridescent blackish brown merging into yellowish brown and then yellowish on the sides, the lowest row of scales being almost white. Below, gulars and genials suffused with pink; ventrals white tinged with pink on their posterior borders, especially on the anterior third of the belly; subcaudals, especially near base of tail, yellowish edged with pink posteriorly.

Spinous hairs defecated by this Toem snake have been identified by Dr. G. H. H. Tate as those of the commonest New Guinea bandicoot (*Echimypera*). The local natives considered this to be one of the deadliest of New Guinean snakes (W. H. S.).

Liasis amethistinus amethistinus (Schneider)

Boa Amethistina Schneider, 1801, Hist. Amphib., **2**, p. 254: No type locality.
Aspidopython Jakati Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 135: Jakati, and Jobi Island, Dutch New Guinea.

Hypaspistes dipsadides Ogilby, 1891, Rec. Australian Mus., **1**, p. 192: Fly River, British New Guinea.

♂ (M. C. Z. 4431) New Ireland (E. Gerrard) 1879.
juv. (M. C. Z. 7297) Astrolabe Bay, A. N. G. (T. Barbour) ca. 1908.
♂ (U. S. N. M. 119548) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Rostral pitted; 2 pairs of prefrontals; a pair of interparietals; parietals bordered by irregular shields; upper labials 12–13, first 4–5 pitted; lower labials 18–21, median 7–8 pitted; midbody scale rows 43–52; ventrals 333; anal 1; subcaudals 120. Largest, a ♂ (U. S. N. M. 119548), has the head and body skinned out so measures 1890 (1500 + 390) mm.

The scale counts of this large individual from the Padaido Islands in the northwest, tend to cast doubts on the validity of *L. a. kinghorni* Stull from Queensland.

Chondropython viridis (Schlegel)

Python viridis Schlegel, 1872, Dierentum Rept., p. 54: Aror = Aru Island, south of Dutch New Guinea.
Chondropython azurea Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 134: "Mysore" = Biak Island, Dutch New Guinea.
Chondropython pulcher Sauvage, 1878, Bull. Soc. Philom. Paris (7), **2**, p. 37: "Misore" = Biak Island, Dutch New Guinea.

♀ (M. C. Z. 7490) Fakfak, D. N. G. (A. E. Pratt) 1907.
♂ (M. C. Z. 7551) Manokwari, D. N. G. (T. Barbour) 1907.
yng. (U. S. N. M. 121214) Buna, A. N. G. (G. M. Kohls) 1944.

Rostral pitted; crown covered with small scales; upper labials 12, first 2–3 pitted; lower labials 15–17, median 6–7 pitted; midbody scale rows 55–70; ventrals 232–236; anal 1; subcaudals 94–104. Length of ♂, 1368 (1166 + 202) mm., ♀, 1387 (1170 + 217) mm. A tooth is present on either side of the premaxilla as pointed out by Dunn (1939, p. 1) for a specimen from Biak Island.

Enygrus asper asper (Günther)

Erebophis asper Günther, 1877, Proc. Zool. Soc. London, p. 132, pl. xxi: No type locality (restricted to Bismarck Archipelago = New Britain Archipelago, by Stull).

♀ (M. C. Z. 4705) New Britain Archipelago (Mus. Godeffroy) 1882.
♀ (M. C. Z. 6282) New Britain Archipelago (J. F. G. Nulauf) 1890.

Upper labials 10; lower labials 12–13; circumorbital scales 13–15; no labials; midbody scale rows 37–41; average 39, ventrals 149–150; anal 1; subcaudals 18–19; dorsal spots ?24–?25, very indistinct. Larger ♀ (M. C. Z. 4707), 660 (612 + 48) mm.

Enygrus asper schmidti Stull

Enygrus asper schmidti Stull, 1932, Occ. Pap. Boston Soc. Nat. Hist., **8**, p. 26: "Kaiserin Augusta River" = Sepik River, Australian New Guinea.

Type ♀ (M. C. Z. 29778) Sepik River, A. N. G. (Amsterdam Mus.) 1931
4 (M. C. Z. 48607–10) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (M. C. Z. 49398) Toem, D. N. G. (W. H. Stickel) 1944.
♀ (U. S. N. M. 118077) Finschhafen, A. N. G. (W. M. Gordon 1944.
♂ (U. S. N. M. 119497) Toem, D. N. G. (W. H. Stickel) 1944.
♂ (U. S. N. M. 119745) Finschhafen, A. N. G. (A. M. Keefe) 1944.

Upper labials 10–12; lower labials 12–16; circumorbital scales 11–16, no labials; midbody scale rows 34–37, average 35.6; ventrals 127–138; anal 1; subcaudals 15–21; dorsal spots ?15–?22, often indistinct or coalescing. Largest ♂ (U. S. N. M. 119497), 453 (410 + 43) mm., ♀ (U. S. N. M. 118077), 708 (650 + 58) mm.

W. H. & L. F. Stickel (1946, p. 11) have pointed out the entire absence of spurs in this large female, also that in the three males the spurs are less curved than in *carinatus*. Stickel records one Toem boa was found on May 31 sluggishly digging a hole with its snout between the buttress roots of a tree growing on a mud flat about a foot from a small creek. The other was taken September 2 from a long-standing heap of humus, earth and plant debris.

Enygrus carinatus (Schneider)

Boa carinata Schneider, 1801, Hist. Amphib., **2**, p. 261: No type locality.
Cenchris ocellata Gray, 1831, in Griffith, Anim. Kingdom, **9**, Synops., p. 97: No type locality.

2 (M. C. Z. 7568–9) Jamna Id., D. N. G. (T. Barbour) 1907.
1 (M. C. Z. 10551) British New Guinea (Queensland Mus.) 1914.
1 (M. C. Z. 44178) Surprise Creek, A. N. G. (H. Stevens) 1933.
3 (M. C. Z. 48611–3) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49399) Saidor, A. N. G. (C. W. Moren) 1944.
4 (M. C. Z. 49446–9) Toem, D. N. G. (W. H. Stickel) 1944.
3 (M. C. Z. 49470–2) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 56577) New Guinea (J. Hurter)

1 (U. S. N. M. 118040) Ahioma, B. N. G. (A. M. Keefe) 1943.
1 (U. S. N. M. 118822) Finschhafen, A. N. G. (A. M. Keefe) 1944.
4 (U. S. N. M. 119498–501) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119502) Gusiko, A. N. G. (J. Kern) 1944.

Upper labials 10–13, average 11.4; lower labials 10–15, average 12.1; circumorbital ring consists of 2, rarely 3, labials and 9–13, average 11.1, other scales; midbody scale rows 32–37, average 34.7; ventrals 170–197, average 180.5; anal 1; subcaudals 35–53, average 48. Largest ♂ (M. C. Z. 10551), 617 (540 + 77) mm., ♀ (U. S. N. M. 56577), 726 (640 + 86) mm.

Part of this material has been studied by W. H. & L. F. Stickel (1946, p. 10) who have charted the length of the male spurs and their development in a few of the adult females. Stickel found the Toem boas under piles of coconut palm fronds and other trash, those from Liki Island were brought in by Natives. One snake held a skink (*Emoia caeruleocauda*), another a larger skink and a third from Aitape, many parasitic worms (*Ophidascaris* sp.).

COLUBRIDAE

Acrochordus granulatus granulatus (Schneider)

Hydrus granulatus Schneider, 1799, Hist. Amphib., **1**, p. 243: India.
Acrochordus fasciatus Shaw, 1802, Gen. Zool., **3**, p. 576, pl. cxxx: No type locality.

♀ (M. C. Z. 7627) Wooi Bay, D. N. G. (T. Barbour) 1907.

Nostrals chiefly directed upwards; midbody scales 110; ventrals absent but a median fold of skin on belly; tail strongly compressed. Length of ♀, 841 (762 + 79) mm.

Chersydrus was synonymized with *Acrochordus* by Malcolm Smith (1943, p. 131); trinomials are employed on account of *A. g. luzonensis* (Loveridge, 1938).

Natrix melanocephala (Werner)

Tropidonotus melanocephalus Werner, 1925, Sitzb. Akad. Wiss. Wien, **134**, p. 47: Port Weber, (Blanche Bay), New Britain.

♀ (M. C. Z. 22201) New Britain (F. Werner) 1926.

Preoculars 2; postoculars 3; upper labials 9, the fifth and sixth entering the orbit; lower labials 9, the first 5 in contact with the an-

terior sublinguals; midbody scale rows 17; ventrals 178; anals 2; subcaudals 109. Length 849 (580 + 269) mm.

This snake bears a label "Paratypen. (Werner coll. No. 1340)," and was bought as such. Apart from minor discrepancies in ventral and subcaudal counts its length bears no resemblance to that given by Werner — 1163 (803 + 360) mm. — for the only paratype mentioned. Perhaps the relationship of this snake to the New Guinean *hypomelas* is that of a subspecies.

Natrix doriae (Boulenger)

Tropidonotus doriae Boulenger, 1897, Ann. Mus. Civ. Stor. Nat. Genova (2), **18**, p. 704: Haveri, Moroka District, British New Guinea.

♂ (M. C. Z. 28469) British New Guinea (Brit. Mus.) 1929.

Preoculars 2; postoculars 3; upper labials 8, the third, fourth and fifth entering the orbit; lower labials 9, the first 5 in contact with the anterior sublinguals; midbody scale rows 17; ventrals 153; anals 2; subcaudals 74+, tip of tail missing.

Natrix mairii multiscutellata Brongersma

Natrix mairii multiscutellata Brongersma, 1948, Proc. Kon. Ned. Akad. Wetensch. (Amsterdam), **51**, pr. 372: Alkmaar, Lorentz River, Dutch New Guinea.

2 (M. C. Z. 7308) Fakfak, D. N. G. (A. E. Pratt) 1909.
[1]3 (M. C. Z. 44171–3) Mt. Misim, A. N. G. (H. Stevens) 1933.
[1]1 (M. C. Z. 44174) Wau, A. N. G. (H. Stevens) 1933.
[1]1 (M. C. Z. 48615) Aitape, A. N. G. (W. M. Beck) 1944.
1 (M. C. Z. 49473) Liki Id., D. N. G. (W. H. Stickel) 1944.
1 (M. C. Z. 49474) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 124638) Toem, D. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 124930) Biak Id., D. N. G. (W. M. Welch) 1944.

Preoculars 2; postoculars 3, rarely 2 (right side of M. C. Z. 44172 only); upper labials 7–9, the third, fourth and fifth, the fourth and fifth, or the fourth, fifth and sixth entering the orbit; lower labials 8–9, the first 4, or 5, or 6, in contact with the anterior sublinguals; midbody scale rows 15; ventrals 143–169; anals 2; subcaudals 66–97.

[1]Brongersma (whose paper I have seen in galley) regards those five snakes as representing an intermediate form.

Largest ♂ (M. C. Z. 49473), 840 (600 + 240) mm., ♀ (M. C. Z. 44171). 794 (604 + 190) mm.

The upper lip and collar of a young Toem snake were light orange in life, according to Stickel who found it swimming in a small pool in a sago swamp. The Toem male was on land a hundred yards from water, while the Liki Island male was captured in wet jungle.

Stegonotus magnus (Meyer)

Lycodon magnus Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 136: "Mysore" = Biak Island, Dutch New Guinea.

♂ ♀ (M. C. Z. 7312) Fakfak, D. N. G. (A. E. Pratt) 1909.
♂ (U. S. N. M. 124635) Toem, D. N. G. (W. H. Stickel) 1944.

Preoculars 2; postoculars 2; upper labials 7–9, the third and fourth or fourth and fifth entering the orbit; lower labials 8–10, the first 4 or 5 in contact with the anterior sublinguals; anterior temporals 2 but fused erratically; midbody scale rows 19; ventrals 202–219; anal 1; subcaudals 86–92 pairs. Length of ♂ (M. C. Z. 7312), 962 (730 + 231) mm., ♀, 586 (456 + 130) mm.

Color in life of Toem male as recorded by Stickel. Above, pinkish gray-brown, head darker; upper labials grayish pink with yellow area on fourth and fifth; lower labials grayish pink tinged with yellow. Below, throat reddish lavender; belly pale dull pinkish lavender with the edges of the ventrals grayer; subcaudals paler with faint gray transverse streaks and a narrower, median, gray stripe.

This Toem snake was found in a long-standing and partly revegetated heap of humus, earth and plant debris. The Fakfak specimens were referred by Barbour (1912, p. 115) to *modestus* (Schlegel), a species with only 17 midbody scale rows. Whether *S. poechi* Werner, without locality, can be synonymized with *magnus*, seems doubtful.

Stegonotus modestus (Schlegel)

Lycodon modestus Schlegel, 1837, Phys. Serp., **2**, p. 119, pl. iv, figs. 16–17: Amboina Island and New Guinea.

Lycodon cucullatum Duméril & Bibron, 1854, Erpét. Gén., **7**, p. 376: "Havre Dorey" = Dore Harbor, Jobi Island, Dutch New Guinea.

Stegonotus reticulatus Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 31: Ferguson Island, British New Guinea.

♀ (M. C. Z. 44175) Wau, A. N. G. (H. Stevens) 1933.
♂ (M. C. Z. 49483) Toem, D. N. G. (W. H. Stickel) 1944.
2 juv. (U. S. N. M. 119510–1) Gusiko, A. N. G. (J. F. Cassel) 1944.
♂ (U. S. N. M. 119549) Mios Woendi, D. N. G. (G. H. Penn) 1944.
♂ skin (U. S. N. M. 119746) Finschhafen, A. N. G. (A. M. Keefe) 1944.

Preoculars 1–2 (both conditions in U. S. N. M. 119510); postoculars 2; upper labials 7–9, the third and fourth or fourth and fifth entering the orbit; lower labials 8–9, the first 4 or 5 in contact with the anterior sublinguals; anterior temporals 2; midbody scale rows 17; ventrals 167–207; anal 1; subcaudals 81–83 pairs, tips missing in all three males. Length of ♂ (U. S. N. M. 119746), 1256+ (1000 + 256+) mm., ♀ (M. C. Z. 44175), 541 (400 + 141) mm.

One adult ♂ (U. S. N. M. 119746) is plumbeous, the other reddish brown reticulated with black. The Toem male was found at night in the leaf axil of a cocos tree by Alfred Haffer.

Stegonotus guentheri Boulenger

Stegonotus guentheri Boulenger, 1895, Ann. Mag. Nat. Hist. (6), **16**, p. 31: Ferguson Island, British New Guinea.

♂ ♂ (M. C. Z. 7313) Fakfak, D. N. G. (A. E. Pratt) 1909.

Preocular 1; postoculars 1–2; upper labials 7, the third and fourth entering the orbit; lower labials 7–8, the first 4 in contact with the anterior sublinguals; anterior temporals 1–2 (1 on right, 2 on left of one snake); midbody scale rows 15; ventrals 179–185; anal 1; subcaudals 104+–120 pairs; uniformly white below. Larger ♂, 653 (450 + 203) mm.

These specimens were referred by Barbour (1912, p. 115) to *cucullatus* (Duméril & Bibron), a species with 17 midbody scale rows. Whether *S. dorsalis* Werner, without locality, is a synonym, is worth considering.

Stegonotus diehli Lindholm

Stegonotus diehli Lindholm, 1905, Jahrb. Nassau Ver. Naturk., **58**, p. 236: Bogadjim, Astrolabe Bay, Australian New Guinea.

3 (M. C. Z. 49475, 49484–5) Toem, D. N. G. (W. H. Stickel) 1944.
1 (M. C. Z. 49491) Saidor, A. N. G. (C. W. Moren) 1944.
3 (U. S. N. M. 119507–9) Toem, D. N. G. (W. H. Stickel) 1944.

Preocular 1–2 (2 in M. C. Z. 49491 only); postoculars 2; upper

labials 7, the third and fourth entering the orbit; lower labials 7–8, the first 4 in contact with the anterior sublinguals; anterior temporals ?2, erratically fused; midbody scale rows 15; ventrals 161–176; anal 1; subcaudals 78–90 pairs, each edged with gray and a gray spot at base. Length of ♂ (U. S. N. M. 119507), 620 (453 + 167) mm., ♀ (M. C. Z. 49485), 503 (367 + 136) mm., juvenile (M. C. Z. 49491), 195 (150 + 45) mm.

Color in life of a ♀ (M. C. Z. 49484) as recorded by Stickel. Above, dark gray-brown; labials gray-white with dark sutures. Below, the three foremost ventrals yellow at base, the remaining ventrals white with yellow spots on their antero-lateral edges; subcaudals white, each with a brown antero-median blotch. I might add that the juvenile coloration is strikingly different from that of the adults, the head being white blotched and spotted with brown; body brown, each scale light-edged. Below, white, uniform.

Of the characters utilized by de Rooij (1917, p. 114) to separate this species from *guentheri* only the ventral count holds, and even so there is a slight overlap. In our material the fewer subcaudals and different coloring suffice. One might be tempted to regard *diehli* as a race of *guentheri* but for our Fakfak specimens revealing that *guentheri* occurs in the northwest as well as the southeast.

Ahaetulla punctulata lineolata (Jacquinot & Guichenot)

Dendrophis lineolata Jacquinot & Guichenot, 1853, in Voyage au Pole Sud . . . Astrolabe . . . , Zool., **3**, Rept. et Poiss., p. 20, pl. ii, fig. 1: New Guinea.

Dendrophis punctulatus var. *atrostriata* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 136: "Jobi and Mysore" i.e. Jappen and Biak Islands, Dutch New Guinea.

Dendrophis punctulatus var. *fasciata* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 136: Passim, Geelvink Bay, Dutch New Guinea.

Dendrophis macrops Günther, 1877, Proc. Zool. Soc. London, p. 131, fig.: Duke of York Island, New Britain Archipelago.

Dendrophis breviceps Macleay, 1877. Proc. Linn. Soc. N. S. W., **2**, p. 37: "Katow" = Binaturi River, British New Guinea.

Dendrophis papuae Ogilby, 1891, Rec. Australian Mus., **1**, p. 193: Fly River, British New Guinea.

Dendrophis elegans Ogilby, 1891, Rec. Australian Mus., **1**, p. 194: Fly River, British New Guinea.

Dendrophis gastrosticta Boulenger, 1894, Cat. Snakes Brit. Mus., **2**, p. 86, pl. iv, fig. 3: "Northwest" i.e. Dutch New Guinea.

Dendrophis nouhuysii de Jeude, 1911, Nova Guinea, **5**, p. 277, pl. viii, fig. 3: Lorentz River, Dutch New Guinea.

♂ juv. (M. C. Z. 48618) Aitape, A. N. G. (W. M. Beck) 1944.
♀ (U. S. N. M. 124636) Toem, D. N. G. (W. H. Stickel) 1944.

Preocular 1; postoculars 2; diameter of eye longer (♀), or much longer (♂ juv.), than its distance from the nostril; upper labials 9, the fourth, fifth and sixth, or fifth and sixth, entering the orbit; lower labials 9, the first 5 in contact with the anterior sublinguals; frontal much longer (♂ juv.), or shorter than (♀), its distance from end of snout; midbody scale rows 13; ventrals 193–197; anals 2; subcaudals 143 (♂), missing in ♀, which measures 1276+ (922 + 354+) mm.

Color in life of ♀ as recorded by Stickel. Above, head olive; rostral, side of snout, upper and lower lips chrome yellow; loreal region yellowish olive; iris grayish brown; temporals olive; anterior part of back olive, the scales edged with brownish black posteriorly; vertebral row edged with blue anteriorly; lateral scales yellow ventrally; at midbody, end of body, as well as tail, the scales are yellowish olive, blue ventrally. Below, sides of ventrals greenish, then bluish yellow; anterior part of belly bluish white, posteriorly grayish mottled with yellow; tail yellow with a median, black-flecked stripe.

Dendrophis meeki Boulenger is omitted from the synonymy on account of Parker's (1936, p. 91) findings. Neither specimen mentioned above has a black streak on the side of the head, while both show the characteristic dusky longitudinal line beneath the tail. A third specimen labeled "*Dendrophis lineolatus* H. & J., German New Guinea. No. 708.", purchased in 1928 from Franz Werner, like so much of Werner's material was poorly localized. It differs from *lineolata* in the low number of subcaudals (117) and absence of subcaudal streak, while the rubbed snout suggested it had been long in confinement. It was in fact a typical Australian *A. p. punctulata* (Gray) with examples of which it has been compared before being discarded.

Ahaetulla calligaster schlenckeri (Macleay)

Dendrelaphis schlenckeri Macleay, 1898, Proc. Linn. Soc. N. S. W., **5**, p. 361: Fife Bay, British New Guinea.

♀ (M. C. Z. 44170) Mt. Misim, A. N. G. (H. Stevens) 1938.
♂ & juv. (M. C. Z. 48616–7) Aitape, A. N. G. (W. M. Beck) 1944.
juv. (M. C. Z. 49400) Saidor, A. N. G. (C. W. Moren) 1944.
7 (M. C. Z. 49476–82) Toem, D. N. G. (W. H. Stickel) 1944.
♀ (M. C. Z. 49489) Hollandia, D. N. G. (C. W. Moren) 1944.
♂ (U. S. N. M. 119190) Gusiko, A. N. G. (J. F. Cassel) 1944.

♂ ♀ (U. S. N. M. 119504–5) Gusiko, A. N. G. (W. H. Stickel) 1944.
♀ (U. S. N. M. 119506) Toem, D. N. G. (W. H. Stickel) 1944.
Head (U. S. N. M. 119550) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Preocular 1; postoculars 1–2; diameter of eye equal to its distance from the nostril; upper labials 8–9, the fourth and fifth, fourth, fifth and sixth, or fifth and sixth entering the orbit; lower labials 8–10, the first 5 in contact with the anterior sublinguals; frontal shorter than (4 ex.), equal to (7 ex.), or longer than (6 ex.), its distance from the end of the snout; midbody scales 13; ventrals 172–186; anals 2; subcaudals 123–144. Largest ♂ (M. C. Z. 48616), 919+ (636 + 283+) mm., ♀ (M. C. Z. 44170), 1239 (805 + 434) mm.

Color in life of a ♂ (M. C. Z. 49476) as recorded by Stickel. Above, head dull brown, eye bronze brown, upper lip yellow; back bronze brown, lower edges of the scales on neck and forepart robin's egg blue, second row of dorsals on posterior part of neck greenish yellow, the first row colored like belly. Below, chin, throat and neck pale yellow; belly and subcaudals rather light reddish bronze.

Color of ♀ (M. C. Z. 49482) after a fortnight in alcohol, as recorded by Stickel. Above, head olive brown, upper lip cream with yellow cast dorsally; back medium brown; first scale row of neck grayish edged below with yellow, second, third, and fourth yellow below, brown above, fifth and sixth blue below and brown above. Below, lower jaw and throat creamy; belly gray on cream, the ventrals edged with yellow.

I should have been inclined to apply *papuensis* (Boulenger, 1896) to these New Guinean specimens were it not for Meise and Hennig (1932, p. 278) regarding *papuensis* as a color form occurring on the islands off the southeast coast from whence I have no material.

Most of the series were taken by Stickel in the compound or brushy jungle; one (M. C. Z. 49477) was seen to fall at least seventy-five feet from a tree into the roadway where it was run over by two cars. One snake (M. C. Z. 49476) had swallowed a skink (*Lygosoma* (*L.*) *f. fuscum*) while another held a large frog (*Hyla arfakiana*).

Ahaetulla calligaster salomonis (Günther)

Dendrophis salomonis Günther, 1867, Ann. Mag. Nat. Hist. (4), **5**, p. 25: SolomonIslands.

♂ (M. C. Z. 4703) New Britain (Hamburg Mus.) 1882.
♂ ♀ (M. C. Z. 10273–4) New Britain (Australian Mus.) 1914.

Preocular 1; postoculars 2; diameter of eye equal to its distance from the nostril; upper labials 8–9, the fourth and fifth or fifth and sixth entering the orbit; lower labials 9–10, the first 5 in contact with the anterior sublinguals; frontal shorter than, equal to, or longer than its distance from the end of the snout; midbody scale rows 13; ventrals 189–194; anals 2; subcaudals 154–158. Larger ♂ (M. C. Z. 10274), 796 (518 + 278) mm., ♀, 1155 (768 + 387).

Boiga irregularis irregularis (Merrem)

Coluber irregularis Merrem, 1802, in Bechstein, Herr de la Cepede's Naturg. Amphib., **4**, p. 239, pl. xxxvii, fig. 1: No type locality.

Hurria pseudoboiga Daudin, 1803, Hist. Nat. Rept., **5**, p. 277, pl. lix, figs. 8–9; lxvi, figs. 1 and 3: nom. nov. for *irregularis*.

Pappophis laticeps Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 39: Hall Sound, British New Guinea.

Pappohis flavigastra Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 40: "Katow" = Binaturi River, British New Guinea.

Dipsadomorphus irregularis papuanus Méhely, 1898, Termés. Füzetek (Budapest), **21**, p. 172: Seleo Island near Berlinhafen, i.e. Aitape, Australian New Guinea (restricted).

Mislaid (M. C. Z. 7567) Manokwari, D. N. G. (T. Barbour) 1907.
2 (M. C. Z. 44179–80) Bulowat, A. N. G. (H. Stevens) 1933.
2 (M. C. Z. 48619–20) Aitape, A. N. G. (W. M. Beck) 1944.
Head (M. C. Z. 49490) southeast A. N. G. (C. W. Moren) 1944.
1 (M. C. Z. 49621) Mios Woendi, D. N. G. (G. H. Penn) 1944.
1 (U. S. N. M. 118821) Finschhafen, A. N. G. (A. M. Keefe) 1944.
1 (U. S. N. M. 119191) Gusiko, A. N. G. (J. F. Cassel) 1944.
2 (U. S. N. M. 119512–3) Gusiko, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 120351) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Preocular 1; postoculars 2; upper labials 9, the fourth, fifth and sixth entering the orbit; lower labials 12–14, the first 5 in contact with the anterior sublinguals; midbody scale rows 21; ventrals 230–255; anal 1; subcaudals 102–113. Largest ♂ (M. C. Z. 44179), 1816+ (1460 + 356+) mm., ♀ (M. C. Z. 48620), 1363 (1060 + 303) mm.

Color in life of a ♀ (U. S. N. M. 119512) as recorded by Stickel. Above, head olive brown, upper lip dull yellowish, paler where bordering mouth, marked with brownish anteriorly and posteriorly; body olive-brown becoming grayer laterally. Below, bright yellow anteriorly the ventrals on last two-thirds of body are pale, dull, pinkish-buffy medially, pink laterally; subcaudals whitish medially, pink laterally.

This snake was taken on the night of May 14 on coastal road about eighteen miles north of Gusiko, the road being flanked by Kunai grass with coral limestone cliffs about fifty feet away on either side. The young male from Gusiko was found dead on road passing through grassy flats on coral terrace and within one or two hundred feet of coral cliffs.

Fordonia leucobalia (Schlegel)

Homalopsis leucobalia (Schlegel), 1837, Phys. Serp., **2**, p. 345, pl. xiii, figs. 8–9: Timor Island, Lesser Sunda Islands.

?*Fordonia Papuensis* Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 35: "Katow" i.e. Binaturi River, British New Guinea.

♂, 4 ♀ ♀ (M. C. Z. 22813–7) Merauke, D. N. G. (P. T. L. Putnam) 1927.

No loreal; preocular 1; postoculars 2; upper labials 5, the third entering the orbit; lower labials 7, the first 3 or 4 in contact with the anterior sublinguals; midbody scale rows 25–27; ventrals 151–156; anals 2; subcaudals 31–39. Length of ♂ (M. C. Z. 22814), 565 (485 + 80) mm., largest ♀ (M. C. Z. 22813), 734 (657 + 77) mm. Coloration uniform or blotched. Nematodes (*Ortleppina longissima*) were recovered from the stomach of one specimen.

Boulenger suggests that *papuensis* Macleay, with 22 midbody scale rows and third labial excluded from the orbit, may be based on an aberrant individual, but Macleay states he had "several specimens." It is quite time someone reëxamined them and settled the matter. Numerous differences make Macleay's description impossible to reconcile with *Cerberus r. novaeguineae.*

Cerberus rynchops novaeguineae subsp. nov.

Type. Museum of Comparative Zoölogy, No. 22818, an adult ♂ from Merauke, Dutch New Guinea, collected by P. T. L. Putnam in 1927.

Paratypes. Museum of Comparative Zoölogy, Nos. 22819–21 (♀, ♀, ♂) and a head, with same data as the type.

Diagnosis. Differs from typical *rynchops* in the lower number of subcaudals in both sexes, from *r. australis* as follows:

1. Midbody scales in 23–25, exceptionally 27, rows; ventrals less than 160 2
   Midbody scales in 27–29 rows; ventrals more than 160; range: Babuyan and Luzon Islands, Philippine Islands . . . . . *mierolepis*
2. Subcaudals 43–51 3
   Subcaudals 50–69 (49–72 in literature), viz. 50–62 for 32 ♀♀, 55–69 for 38 ♂♂; range: India and Ceylon east through Indo-China to the Philippine and Pelew Islands south to Timor . . . *r. rynchops*
3. Nasal cleft usually (8 out of 10 sides) extending to first labial; loreal in contact with second, third and fourth labials (9 sides), or second and third only (1 side); range: New Guinea (? southern only) . . . . . *r. novaeguineae*
   Nasal cleft usually extending to the second labial; loreal in contact with the second and third labials (7 sides), or second, third and fourth (1 side); range: northern Australia . . . . . *r. australis*

C. r. australis also apparently differs from *novaeguineae* in its vivid color pattern. All four kinds of *Cerberus* are represented in the Museum of Comparative Zoölogy.

Description. (Of Paratypes, where they differ from the type, in parenthesis). Preocular 1; postoculars 2; upper labials 9–10; lower labials 9 (–10), the first 4 (3 on left side of uncatalogued head) in contact with the anterior sublinguals; midbody scale rows 23; ventrals 145 (–151); anals 2; subcaudals (43–) 49 (♂♂ 48–49, ♀♀ 43–44). Length of type ♂, 827 (690 + 137) mm., of ♀ (M. C. Z. 22819), 780 (656 + 124) mm.

That *Cerberus*, and not *Hurria*, is the correct name for this genus of water snakes has been pointed out by Malcolm Smith (1930, p. 61) who, however, (1943, p. 393) follows Boulenger (1896, p. 16) in misquoting Schneider's spelling of *rynchops*.

Myron richardsonii Gray

Myron richardsonii Gray, 1849, Cat. Snakes Brit. Mus., p. 70: Northwest Australia.

♂ (M. C. Z. 38963) Bivak Id., D. N. G. (Leiden Mus.) 1935.

Loreal 1; preocular 1; postoculars 2; upper labials 9, the fourth entering the orbit; lower labials 11, the first 3–4 in contact with the anterior sublinguals; midbody scale rows 21; ventrals 135; anals 2; subcaudals 39 pairs. Length of ♂, 356 (300 + 56) mm.

ELAPIDAE

Aspidomorphus schlegelii (Günther)

Diemenia schlegelii Günther, 1872, Ann. Mag. Nat. Hist. (9), **4**, pp. 14, 35: Misool Island, Molucca Islands.

Pseudelaps muelleri insulae Barbour, 1908, Bull. Mus. Comp. Zoöl., **51**, p. 320: Djamna = Jamna Island, Dutch New Guinea.

Pseudelaps muelleri var. *concolor* Werner, 1925, Sitzb. Akad. Wiss. **134**, Abt. **1**, p. 63: Fakfak, Dutch New Guinea.

♀ (M. C. Z. 7080) Jamna Id., D. N. G. (T. Barbour) 1907.
♂ (M. C. Z. 7311) Fakfak, D. N. G. (T. Barbour) 1909.
♂ (M. C. Z. 38967) Salawati Id., D. N. G. (Leiden Mus.) 1935.
♂ ♀ (U. S. N. M. 119514–5) Toem, D. N. G. (W. H. Stickel) 1944.
♂ (U. S. N. M. 124929) Biak Id., D. N. G. (W. M. Welch) 1944.

Top of head unspotted or almost so; an uninterrupted light streak on side of head; snout flat; upper labials 6, the third and fourth entering the orbit; lower labials 6, the first 4 in contact with the anterior sublinguals; midbody scales 15; ventrals 140–148; anals 2; subcaudals 18–27. Largest ♂ (M. C. Z. 7311), 397 (358 + 39) mm., larger ♀ (M. C. Z. 7080), 387 (355 + 32) mm.

The Jamna Island female is holotype of *insulae*, here sexed and correctly measured for the first time. It was placed in the synonymy by Brongersma (1934, p. 235) who unravelled the involved synonymy of this species with *mulleri* and its numerous races.

Aspidomorphus mulleri mulleri (Schlegel)

Elaps mulleri Schlegel, 1837, Phys. Serp., **1**, pp. 182, 243 (part), pl. xvi, figs. 16–17: In forest at base of Mount Lamantsiri, Lobo, Triton Bay, Dutch New Guinea.

♀ (M. C. Z. 38966) Salawati Id., D. N. G. (Leiden Mus.) 1935.
♂ ♀ (M. C. Z. 48621–2) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (M. C. Z. 49486) Toem, D. N. G. (W. H. Stickel) 1944.
♂ ♂ ♀ (U. S. N. M. 119517–9) Toem, D. N. G. (W. H. Stickel) 1944.

Top of head with light-edged dark spots; a dark suborbital bar interrupts the light streak on side of head; snout sloping downwards; upper labials 7, the third and fourth entering the orbit; lower labials 7, the first 3 or 4, or first, third and fourth only, in contact with the anterior sublinguals; midbody scale rows 15; ventrals 162–177; anals

2; subcaudals 29–38. Largest ♂ (U. S. N. M. 119519), 662 (568 + 94) mm., ♀ (M. C. Z. 38966), 661 (585 + 76) mm.

Pseudechis australis australis (Gray)

Naja australis Gray, 1842, Zool. Misc., p. 55: Northeast Australia.

♀ (M. C. Z. 22811) Merauke, D. N. G. (P. T. L. Putnam) 1927.

Rostral much broader than deep; internasals less than half as long as the prefrontals; frontal once and two-thirds as broad as long; upper labials 6, the third and fourth entering the orbit; midbody scale rows 17; ventrals 191; anals 2; subcaudals 53, *all single* except the last. Length of ♀, 1068 (910 + 158) mm.

The unique condition of the subcaudals in this snake has already been the subject of comment (Loveridge, 1927, p. 58).

Micropechis ikaheka ikaheka (Lesson)

Coluber ikaheka Lesson, 1830, Zool., in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, pt. 1, p. 54, pl. v: Forests fringing Dorerey = Dore Harbor, Dutch New Guinea.

Naja elaps Schlegel, 1837, Phys. Serp., **2**, p. 485: No type locality.

♂ (M. C. Z. 22377) Fakfak, D. N. G. (Brit. Mus.) 1926.

Preocular 1; postoculars 2; temporals 2 + 2; upper labials 6, the third and fourth entering the orbit; lower labials 7, the first 4 in contact with the anterior sublinguals; midbody scale rows 15; ventrals 183; anals 2; subcaudals 37–43 pairs. Length of ♂, 1064 (925 + 139) mm.

While there is apparently no appreciable difference in squamation, the striking coloring of this Fakfak specimen is as figured and described by Lesson and in my (1945, p. 161) key to the genus.

Micropechis ikaheka fasciatus Fischer

Ophiophagus ikaheka var. *fasciatus* Fischer, 1884, Abhand. Nat. Ver. Hamburg., **8**, p. 10, pl. vii, figs. 3a–c: Aru Islands.

♂♂ (M. C. Z. 48623–4) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (U. S. N. M. 119520) Gusiko, A. N. G. (W. H. Stickel) 1944.

These males agree with the squamation given for the typical form except that the range of ventrals is 180–185; subcaudals 37–39. Largest perfect ♂ (M. C. Z. 48624), 1314 (1150 + 164) mm. In color pattern, being more or less banded, they agree with *i. fasciatus* and the Solomons' race *i. clapoides*. The Gusiko snake was taken after rain in a jungle ravine through which ran a small stream, where it was captured by J. M. Kern and Captain J. F. Mangrum.

Acanthophis antarcticus antarcticus (Shaw)

Boa antarctica Shaw, 1794, Nat. Misc., pl. ccccxxv: Australasia.
Boa palpebrosa Shaw, 1802, Gen. Zool., **3**, p. 362: No type locality.
Acanthophis cerastinus Daudin, 1803, Hist. Nat. Rept., **5**, p. 289, pl. lxvii: No type locality.
Acanthophis laevis Macleay, 1877, Proc. Linn. Soc. N. S. W., **2**, p. 40: "Katow" = Binaturi River, British New Guinea.

♀ (M. C. Z. 7565) Manokwari, D. N. G. (T. Barbour) 1907.
♂ (M. C. Z. 38965) Great Kei Id. (Leiden Mus.) 1935.
♀ (M. C. Z. 44176) Surprise Creek, A. N. G. (H. Stevens) 1933.
juv. (M. C. Z. 46492) Buna, B. N. G. (C. W. Moren) 1944.
♀ (U. S. N. M. 119192) Gusiko, A. N. G. (J. F. Cassel) 1944.
juv. (U. S. N. M. 119516) Toem, D. N. G. (W. H. Stickel) 1944.

Head shields smooth; preocular 1; postoculars 2; suboculars 1–3; upper labials 6–7; lower labials 7–8, the first 4, or first, third and fourth only, in contact with the anterior sublinguals; temporals 1 + 2, 1 + 3, 2 + 2 or 2 + 3; midbody scale rows 21–22 (actually 19 or 20 at precise midbody of M. C. Z. 38965); ventrals 111–131; anal 1; subcaudals 43–51. Largest, a ♀ (M. C. Z. 44176), 591 (490 + 101) mm.

Nematodes (*Abbreviata* sp., *Kalicephalus* sp., and ♀ Spiruroidea) were recovered from the stomach of the Manokwari death adder.

Acanthophis antarcticus rugosus subsp. nov.

Type. Museum of Comparative Zoölogy, No. 22812, an adult ♂ from Merauke, southwest Dutch New Guinea, collected by P. T. L. Putnam in 1927.

Paratype. A head with same data as type.

Diagnosis. Head shields very strongly rugose, otherwise like the typical banded form of *antarctica* figured by Shaw which appears to have smooth head shields.

Description. Preocular 1; postoculars 2; suboculars 2–3; upper labials 7 (6 in paratype); lower labials 8, the first 4 in contact with the anterior sublinguals; temporals 2 + 3; midbody scale rows 21; ventrals 119; anal 1; subcaudals 48, the first 30 single, the posterior 18 paired. Length of type ♂, 595 (500 + 95) mm. Body with 30 broad, dark crossbands, tail with 10.

HYDROPHIIDAE

From Australian or Indonesian oceans the Museum of Comparative Zoölogy has all but two of the score of sea snakes definitely known as occurring on the coasts of New Guinea and the Aru Islands. Only those clearly taken from New Guinean seas are dealt with below.

Laticauda laticaudata (Linné)

Coluber laticaudatus Linné (part), 1758, Syst. Nat. (ed. 10), **1**, p. 222: "Indiis."

♀ (M. C. Z. 23793) Geelvink Bay, D. N. G. (M. A. Smith) 1927.

Prefrontals 2; upper lip brown; midbody scale rows 19; ventrals about 226. Tail missing.

Laticauda colubrina (Schneider)

Hydrus colubrinus Schneider, 1799, Hist. Amphib., **1**, p. 238: No type locality.

♂ (M. C. Z. 10546) British New Guinea (Queensland Mus.) 1914.

Prefrontals 3; upper lip mostly white; midbody scale rows 23; ventrals 219; anals 2; subcaudals 43. Length 399 (350 + 49) mm.

Hydrophis fasciatus atriceps Günther

Hydrophis atriceps Günther, 1864, Rept. British India, p. 371, pl. xxv, figs. I–I′: Siam.

♂ (U. S. N. M. 124637) Toem, D. N. G. (W. H. Stickel) 1944.

Prefrontals 2; head black except for a light postocular and another temporal spot; midbody scale rows 40; ventrals 340; anals 2; subcaudals 56. Length 873 (785 + 88) mm.

The snake (M. C. Z. 29787) from Broome, West Australia, which I (1934, p. 295) referred to this race, is, in reality, an example of *Hydrophis elegans* (Gray).

SALIENTIA

HYLIDAE

The arrangement of species is substantially that of van Kampen (1923, p. ix). Though that author refers to a very small outer metatarsal tubercle being present in *montana, arfakiana* and *congenita,* actually it is a small subarticular tubercle at the base of the fourth toe to which he alludes. None of the sixteen species mentioned below have an outer metatarsal tubercle. For the sake of brevity the word "eye" is used instead of "orbital diameter," and "heel" in place of "tibiotarsal articulation of the adpressed hind limb."

Hyla graminea Boulenger

Hyla graminea Boulenger, 1905, Ann. Mag. Nat. Hist. (7), **16**, p. 183: At 9,000 feet, northern British New Guinea.

♀ (M. C. Z. 26526) Toem, D. N. G. (W. H. Stickel) 1944.
♂ (U. S. N. M. 119172) Milne Bay, B. N. G. (J. F. Cassel) 1944.
♂ (U. S. N. M. 119543) Mios Woendi, D. N. G. (G. H. Penn) 1944.

Vomerine teeth between the choanae; head as long as broad; snout once and a half to once and two-thirds as long as the eye; interorbital space nearly twice as long as an upper eyelid; tympanum three-quarters the eye diameter; outer finger webbed to disk; heel reaches to between eye and nostril (♂. ♀) or beyond end of snout (U. S. N. M. 119543). This last specimen, therefore, would run down to *H. rhacophorus,* quite a different frog, in van Kampen's (1923, p. 24) key. Larger ♂ (U. S. N. M. 119543) measures 73 mm., ♀, 65 mm.

Parker (1936, p. 76) refers to a 69 mm. ♂ from Kokoda, B. N. G., as the largest and second known example of this species.

Hyla nigropunctata (Meyer)

Hyperolius nigropunctatus Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 139: Jobi Island, Geelvink Bay, Dutch New Guinea.

Hyla bernsteini Horst, 1883, Notes Leyden Mus., **5**, p. 241: "Gebeh," i.e. Gebe (restricted) and Salawati Islands, Dutch New Guinea.

Hyla ouwensii Barbour, 1908, Bull. Mus. Comp. Zoöl., **51**, p. 325: Pom, north coast of Jobi = Japen Island, Dutch New Guinea.

Hyla (Hylella) nigromaculata (Meyer) Barbour, 1908, Bull. Mus. Comp. Zoöl., **51**, p. 325: *Nomen nudum,* being lapsus for *nigropunctata,* and nothing to do with *Hyla nigromaculata* (Tschudi) of Brazil.

Hyla atropunctata van Kampen, 1923, Amphib. Indo-Australian Archip., p. 37: nom. nov. for *nigropunctata* Meyer, believed preoccupied.

Type ♀ (M. C. Z. 2434) Pom, D. N. G. (T. Barbour) 1903.
♀ (M. C. Z. 9392) New Guinea (Berlin Mus.) 1922.
? ♀ (U. S. N. M. 121216) Dobodura, A. N. G. (G. M. Kohls) 1944.

Vomerine teeth absent; head as long as, or slightly longer than, broad; snout once and a half as long as the eye; interorbital space as broad as, or broader than, an upper eyelid; tympanum half the eye diameter; outer finger webbed to disk; heel reaches to between eye and nostril (M. C. Z. 9392), end of snout (M. C. Z. 2434), or just beyond (U. S. N. M. 121216). The light area on posterior portion of upper jaw is present only in M. C. Z. 9392, but all three exhibit the striking and apparently characteristic black streak on the hind side of thigh and tibia. Largest ♀ (M. C. Z. 2434), 35 mm.

Thus this frog, the type of *ouwensii* is now an eighth of an inch less than the "about an inch and a half" of the original description; its tympanum is clearly equal to half (*not* "a fifth") the eye diameter; the tibio-tarsal articulation does not reach "a considerable distance beyond the snout." The only remaining difference between it and *nigropunctata*, though not mentioned in the description, is a series of white tubercles on the hinder side of the forearm, their position is indicated in one of the others; in *montana* I found the presence of similar tubercles dependent on age.

Hyla nigromaculata appears to be a lapsus for *nigropunctata* (Meyer) for I have failed to find it in the literature prior to 1908. But M. C. Z. 9392 which has borne this name in the collection for almost a quarter of a century, has a curious history. Accompanying it from Berlin was a label that read "*Hyla nigromaculata* Mey. Neu Guinea." However the letters "*cul*" were illegible and in transcribing the name to the M. C. Z. label Barbour wrote "*Hyla nigromarginata* Mayer," and so it remained until recently.

The question arises as to whether this Berlin frog could be the type of *nigropunctata*, no mention having been made of more than one. This, however, seems unlikely as it differs in several points, viz. Nostril twice as far from eye as from tip of snout (*not* a little nearer tip of snout); outer finger almost webbed to disk (*not* almost half-webbed); heel reaches nostril (*not* tip of snout or beyond). Length 31 (*not* 27) mm.; breadth of head 9 (*not* 10) mm.; length of forelimb 11 (*not* 17) mm.; length of hind limb 43 (*not* 47) mm. It should be mentioned that its rather shrivelled state would indicate that the frog had dried out at some time. From its appearance it might well have been collected at the same time as the type.

Boulenger (1882, p. 421) referred Meyer's *nigropunctata* to *Hylella*,

a genus considered unrecognizable by van Kampen (1923, p. 37) who, on transferring *nigropunctata* to *Hyla* renamed it *atropunctata* on the grounds that *nigropunctata* was preoccupied in *Hyla* by a Mexican species of Cope. Actually it is the Mexican frog that requires renaming.

Hyla darlingtoni Loveridge

Hyla darlingtoni Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 53: Mount Wilhelm, Bismarck Range, Madang Division, Australian New Guinea.

Type ♀ (M. C. Z. 25890) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Vomerine teeth between the choanae; head as long as broad; snout twice as long as the eye; interorbital space nearly twice as broad as an upper eyelid; tympanum seven-eighths the eye diameter; outer finger three-quarters webbed but continued as a fringe to the disk; heel reaches to anterior border of eye. Length of gravid ♀, 50 mm.

Hyla montana montana Peters & Doria

Hyla (*Litoria*) *montana* Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 423, pl. vii, fig. 1: Hatam, Arfak Mountains, Dutch New Guinea.

Hyla papua van Kampen, 1909, Nova Guinea, **9**, p. 33, pl. ii, fig. 2: "Noord Fluss" = Lorentz River, near Bivak Island, Dutch New Guinea.

?*Hyla pulchra* Wandolleck, 1911, Abhand. Ber. König. Zool. Mus. Dresden, **13**, No. 6, p. 12, pl. xii, figs. 50–59: Locality omitted.

1 (M. C. Z. 9382) New Guinea (Berlin Mus.) 1922.
24 (M.C.Z. 25880–9) Toromanbanau, A.N.G. (P. J. Darlington) 1944.

Vomerine teeth in two *oblique* series between the choanae; head as long as, or slightly longer or shorter than, broad; snout once and a quarter to once and a half as long as the eye; interorbital space as broad as, or once and a quarter times as broad as, an upper eyelid; tympanum two-fifths (♀) to half the eye diameter; outer finger half-webbed; forearm with a white, crenulated, dermal fold extending as a ridge along outer edge of fourth finger; heel reaches to anterior border of eye or well beyond end of snout. The Tarambanau series consists of one tadpole; one young frog (23 mm. from snout to anus) with stump of tail; one young (21 mm.) without trace of tail; four males

(sexed by dissection, ranging from 44–52 mm.) with uncolored nuptial pads, and twenty males (48–52 mm.) with brown nuptial pads; a single ♀ (M. C. Z. 25880) measuring 76 mm.

Toromanbanau, 7500 feet, in the Bismarck Range, is far removed from the Arfak Mountains in the northwest of the island, but the gap is bridged to a considerable extent by van Kampen's (1923, p. 34) records. The series agrees well with his detailed description except that the vomerine teeth are not in two "transverse" rows as depicted in Peters and Doria's poor illustration, and for the absence of an alleged outer metatarsal tubercle already discussed.

Hyla montana pratti Boulenger

Hyla pratti Boulenger, 1911, Ann. Mag. Nat. Hist. (8), **8**, p. 55: Wendessi, and others from the Arfak Mountains at 8000 feet, Dutch New Guinea.

1 (M. C. Z. 11651) Angi Lakes, Arfak Mtns., D. N. G. (Brit. Mus.) 1925.

Vomerine teeth between the choanae; head as long as broad; snout one and a half times as long as the eye; interorbital space as broad as an upper eyelid; tympanum half the eye diameter; outer finger a third webbed; heel reaches the nostril. Length of gravid ♀, 51 mm.

This frog shows such close relationship to *montana* of the same mountains that I venture to regard it as a subspecies with probable habitat differences. Structurally it differs from *montana* only in the less deeply emarginate tongue; less webbed fingers, the outer being a third instead of half-webbed, absent between first and second fingers and so deeply emarginate that when it does reach the tubercles of second, third, and fourth it does so only as a narrow margin; similarly the second toe is webbed to the tubercle on one side only though to the disk on the other, fifth toe to the disk. One clump of vomerine teeth have never been developed in this individual.

Hyla pygmaea (Meyer)

Hyperolius pygmaeus Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 139: Jobi Island, Dutch New Guinea.

Hylella boulengeri v. Méhely, 1897 (not *Scytopsis boulengeri* Cope, 1887), Termész. Füzetek, **20**, p. 414, pl. x, fig. 8: "Friederich-Wilhelmshafen" i.e. Madang, Australian New Guinea.

Hyla fallax Boulenger, 1898, Proc. Zool. Soc. London, p. 482, pl. xxxix, fig. 4: "Katow" = Binaturi River, British New Guinea.

Hyla mehelyi Nieden, 1923, Das Tierreich, **46**, Anura, **1**, p. 215: nom. nov. for *boulengeri* (v. Méhely) preoccupied in *Hyla*.

1 (M. C. Z. 9384) New Guinea (Berlin Mus.) 1922.
47 (M. C. Z. 25864–5, 26010–9) Aitape, A. N. G. (W. M. Beck) 1944.
7 (U. S. N. M. 119202–8) Toem, D. N. G. (W. H. Stickel) 1944.

Vomerine teeth (absent in young and a 25 mm. frog from Toem) between the posterior borders of the choanae; head as long as, or slightly longer or shorter than, broad; snout once and a quarter times as long as the eye; interorbital space as broad as, or once and a quarter times as broad as, an upper eyelid; tympanum half to two-thirds the eye diameter; outer finger half to two-thirds webbed; heel reaches eye, nostril, or (U. S. N. M. 119203-4) just beyond end of snout. Largest ♂ (M. C. Z. 26011) 32 mm., ♀ (M. C. Z. 26010) 34 mm.; smallest of the young 14 mm. (Meyer's type was 15 mm.).

The juvenile dorsal pattern figured by van Kampen (1923, p. 36, fig. 4) and others, is highly variable and by no means confined to the young, though the majority of adults tend to be uniformly yellowish green or brown above.

Hyla arfakiana Peters & Doria

Hyla arfakiana Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 421, pl. vi, fig. 2: Hatam, Arfak Mountains, Dutch New Guinea.

♂ (M. C. Z. 10754) Hellwig Mtns., D. N. G. (Amsterdam Mus.) 1925.
♂, 4 ♀, 2 juv. (M. C. Z. 23293–9) Mt. Misim, A. N. G. (H. Stevens)1933.

Vomerine teeth in usually oblique series between the choanae; head as long as (young), or shorter than, broad; snout as long as, or longer than, the eye; interorbital space as broad as, more usually broader than, an upper eyelid; tympanum one-third to half (M. C. Z. 23296) the eye diameter; outer finger one-third to half-webbed; *no* outer metatarsal tubercle; heel reaches eye to well beyond end of snout in both sexes; undersurfaces characteristically marbled or vermiculated with brown. Larger ♂ (M. C. Z. 23294), 66 mm., ♀ (M. C. Z. 23293), 80 mm., young 33 mm.

A frog of this species was recovered from the stomach of a bronze-back tree snake (*Ahaetulla calligaster schenkeri*).

Hyla brongersmai Loveridge

Hyla brongersmai Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 56: Parana Valley, Dutch New Guinea.

Type ♂ (M. C. Z. 15203) Parana Valley, D. N. G. (P. Wirz) 1925.

Vomerine teeth absent; head as long as broad; snout once and a third as long as the eye; interorbital space once and a half as broad as an upper eyelid; tympanum three-quarters the eye diameter; outer finger half webbed; heel reaches end of snout. Length of adult ♂, 24 mm.

This frog was received from the late Dr. Jean Roux as *Hyla arfakiana* Peters & Doria, but has little in common with that 70 mm. species, being adult at 24 mm.

Hyla bicolor (Gray)

Eucnemis bicolor Gray, 1842, Zool. Misc., p. 57: Port Essington, Northern Territory, Australia.

5 (M. C. Z. 12846–50) Merauke, D. N. G. (P. T. L. Putnam) 1927.
32 (M. C. Z. 25853–62) Aitape, A. N. G. (W. M. Beek) 1944.
12 (M. C. Z. 26036–40) Aitape, A. N. G. (W. M. Beck) 1944.
8 (M. C. Z. 25996–97) near Darwin, N. T. (T. R. Tovell) 1944.

The almost topotypic Darwin series are from Knuckey's Lagoon about nine miles south of the port. This material is separable into three groups of which the Darwin and ten of the first Aitape series may be regarded as typical, their characters being:

Vomerine teeth absent; head as long as broad; snout once and a quarter to once and a half times as long as the eye; interorbital space broader than an upper eyelid; tympanum half to two-thirds the eye diameter; outer finger one-third webbed; heel reaches eye or end of snout. Largest ♂ (M. C. Z. 25997), 26 mm., gravid ♀ (M. C. Z. 25855), 26 mm., youngest are 20 mm.

As the remaining 22 specimens of the first Aitape series are juveniles without vomerine teeth they may be referable to either the first or the second group of *bicolor* discussed here. This second group is characterized by 6 ♂♂ and 6 ♀ ♀ (M. C. Z. 26036–40) which may be considered as adult for the females are gravid. They apparently differ only in the possession of vomerine teeth and larger size. The possibility of their representing *albolabris* Wandolleck, described from Aitape, is rejected principally because that species is said to have to have

a tympanum only one-third the eye diameter, toes narrowly webbed, upper surface marbled with lighter, lower spotted with brown, and length which is given as about 40 mm. The largest of both sexes (♂ M. C. Z. 26036; ♀ M. C. Z. 26037) in our series measure exactly 30 mm., females of that size being gravid. These twelve adults exhibit some average differences from adults in group one but nothing constant. The tympanum is three-quarters to seven-eighths the eye diameter, while the heel reaches eye (in 1), nostril (in 7), or beyond end of snout (in 4).

The third group is composed of the Merauke frogs in which the heel reaches the end of snout (in 3), or well beyond (in 4). They were seen by van Kampen in 1927 and thought to be referable to *bicolor* though he added that the possibility of their being the young of some larger species should not be ruled out. In size they range from 19–25 mm.

Hyla thesaurensis Peters

Hyla thesaurensis Peters, 1877, Monatsb. Akad. Wiss. Berlin, p. 421: Treasury Island, Solomon Islands (2 ex., 28 mm.).

Hyla impura Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 426, pl. vii, fig. 2: Yule Island, British New Guinea (2 ex., 42 mm.).

Hyla macrops Boulenger, 1883, Ann. Mag. Nat. Hist. (5), **12**, p. 164: Treasury Island, Solomon Islands (♂, 38 mm.).

Hyla macgregori Ogilby, 1890, Rec. Australian Mus., **1**, p. 100: St. Joseph's River = Kito River, British New Guinea (26 ex., max. 30 mm.).

Hyla solomonis Vogt, 1912, Sitzb. Ges. Naturf. Freunde Berlin, p. 10: Bougainville Island, Solomon Islands (♂, 48 mm.).

♀ (M. C. Z. 9373) New Guinea (Berlin Mus.) 1922.

♂ (M. C. Z. 15202) Pionierbiwak, Mamberamo River, D. N. G. (P. Wirz) 1925.

6♂3♀, 75 juv. (M. C. Z. 25866–7, 26020–9) Aitape, A. N. G. (W. M. Beck) 1944.

juv. (M. C. Z. 26067) Liki Id., opp. Sarmi, D. N. G. (W. H. Stickel) 1944.

♂, 2 juv. (M. C. Z. 26068; U. S. N. M. 119200–1) Toem, D. N. G. (J. H. Kern).

Vomerine teeth (absent in very young, developed on left side only in adult M. C. Z. 9373) in oblique, or roundish, groups between the choanae; head as long as, or slightly longer than, broad; snout once and a half times as long as the eye; interorbital space once and a quarter to once and three-quarters as broad as an upper eyelid;

tympanum half to three-quarters the eye diameter; outer finger one-third to half-webbed (U. S. N. M. 119201); outer aspect of forearm with a row of white spots or tubercles; heel reaches eye, nostril (U. S. N. M. 119200 ad. ♂; 119201 juv.) or beyond end of snout (M. C. Z. 26028, etc.). All largest ♂♂ measure 40 mm., females of 43–45 mm. in the Aitape series are gravid, juv. 12–28 mm.

All these seventy-four 12–28 mm. juveniles from Aitape display evidence of recent metamorphosis in an unusually distinct, diamond-shaped, dermal marking around the insertion of the arms. Very few exhibit vomerine teeth. Otherwise they agree with the characters given above except that the developing tympanum is sometimes smaller and there is no sign of tubercles along the forearm. Below, they are immaculate except for a few individuals possessing some conspicuous, scattered, black spots. In this connection it is interesting to note that one adult male shows similar azygous spotting. Thirty-eight of these juveniles, ranging from 16–26 mm., show, though often faintly, a light, broad, vertebral stripe from occiput to anus, at times a pair of dorso-lateral lines are also distinguishable. Though this livery resembles that of the type of *thesaurensis* it is not so conspicuous in these formalin-preserved specimens.

Only one Aitape juvenile (the seventy-fifth), 26 mm. in length, has assumed the three light lines distinctly, but unlike the others the skin around its arms no longer shows any marking, while the tubercles on the outer aspect of the forearm are visible. The three juveniles from other localities range from 22–27 mm., and all display the striped livery. Adults are uniformly olive, brown, or gray above.

The Museum of Comparative Zoölogy is fortunate in possessing a fine series of *thesaurensis* from nine different islands in the Solomon group, and this material clearly demonstrates the untenability of *macrops* and *solomonis*. The reasons for this will be set forth in a report on the herpetofauna of the islands by Mr. W. C. Brown.

The New Guinea species were separated on the grounds that the vomerine teeth were "between the posterior borders of the choanae," instead of "between the choanae." Actually they are between the choanae in both Solomons and Guinean frogs though a slight tilting of the head may give the impression that they are situated between the posterior borders. While *H. impura* was based on the uniformly colored adult, *macgregori* was described from the strikingly striped and patterned young, duplicating what occurred in the Solomons with *thesaurensis* (young) and *macrops* (adult) from Treasury Island.

One juvenile (M. C. Z. 26068) was taken squatting on a leaf in the scrub (J. H. K.).

Hyla angularis Loveridge

Hyla angularis Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 54: Mount Wilhelm, Bismarck Range, Madang Division, Australian New Guinea.

Type ♂, 9 juv. (M. C. Z. 25891–9) Mt. Wilhelm, A. N. G. (P. J. D.) 1944.

Vomerine teeth between the choanae; head longer than broad; snout once and a half as long as the eye; interorbital space nearly twice as broad as an upper eyelid; tympanum about half the eye diameter; outer finger half-webbed; heel reaches the nostril. Length of ♂, 45 mm., juveniles 17–38 mm.

In van Kampen's (1923, p. 26) key the nearest relative appears to be *H. everetti* Boulenger, of Timor, to which species it bears little resemblance.

Hyla infrafrenata infrafrenata Günther

Hyla infrafrenata Günther, June 1867, Ann. Mag. Nat. Hist. (3), **20**, p. 56: Cape York, Queensland.

Calamita dolichopsis Cope, September 1867, Journ. Acad. Nat. Sci. Philadelphia (2), **6**, p. 204: Amboina Island, Molucca Islands.

Litoria guttata Macleay, 1878, Proc. Linn. Soc. N. S. Wales, **2**, p. 137: "Katow" = Binaturi River, British New Guinea.

Hyla doliehopsis var. *tenuigranulata* Boettger, 1895, Zool. Anz., **18**, p. 136: Halmahera Island, Molucca Islands.

Hyla spengleri Boulenger, 1912, Zool. Jahrb. Suppl., **15**, p. 215: Dinawa, Owen Stanley Mountains, British New Guinea.

♀, juv. (M. C. Z. 2675) Sorong, D. N. G. (T. Barbour) 1907.
♂♂ (M. C. Z. 2678) Ternate Id., Moluccas (T. Barbour) 1907.
♀ (M. C. Z. 2680) Manokwari, D. N. G. (T. Barbour) 1907.
14 (M. C. Z. 12143–9; 12158–64) Merauke, D. N. G. (P. T. L. Putnam) 1927.
♂ (M. C. Z. 24288) Karakelang Id., (D. Fairchild) 1940.
♀, 7 juv. (M. C. Z. 25868–72) Aitape, A. N. G. (W. M. Beck) 1944.
♂ (M. C. Z. 26055) Finschhafen, A. N. G. (L. W. Jarcho) 1944.
♂ (M. C. Z. 26056) Gusiko, Kalueng River, A. N. G. (D. Crocker) 1944.
♀ (M. C. Z. 26057) Hollandia, D. N. G. (N. Moren) 1944.
12 (M. C. Z. 26058–63) Toem, D. N. G. (W. H. Stickel) 1944.
3 ♂♂ (M. C. Z. 26064–6) Liki Id., D. N. G. (W. H. Stickel) 1944.
♂ (U. S. N. M. 57718) Sorong, D. N. G. (T. Barbour) 1907.
♀ (U. S. N. M. 119744) Finschhafen, A. N. G. (A. Keefe)
♀ (U. S. N. M. 121215) Sansapor, D. N. G. (G. M. Kohls) 1943.

Vomerine teeth (absent or only indicated in 22 mm. juveniles) between the choanae; head as long as, or slightly longer than, broad; snout once and a half to twice (M. C. Z. 2678, 12148, 25868, 25871) as long as the eye; interorbital space once and a quarter to once and three-quarter times as broad as an upper eyelid; tympanum (absent on right side of M. C. Z. 12143) two-thirds to ten-elevenths the eye diameter; outer finger half (young) to two-thirds (adults) webbed; heel reaches eye or beyond end of snout. Largest ♂♂ (M. C. Z. 26064–6) measure 100 mm., ♀ (M. C. Z. 26057), 130 mm., smallest frog (M. C. Z. 26062) 21 mm.

H. spengleri was based on an exceptionally large 115 mm. frog which differed from most *infrafrenata* in having a tympanum "as large as the eye," instead of the normal two-thirds to four-fifths. In seven frogs listed above with snout to anus lengths ranging from 34 to 115 mm. in length the tympanum eye relationship in millimetres is 3/, 3/45, 3/5, 3.5/5, 4/5, 5/7:5, 6/9, 10/11. This seems to indicate that with growth there is a tendency for the tympanum to increase in size more rapidly than the eye. As Kinghorn (1928, p. 289) once suggested might happen, *H. spengleri* must be regarded as a synonym of *infrafrenata*.

The color in life, or rather 45 minutes after death, of a 118 mm. ♀ (M. C. Z. 26059) from Toem, was recorded by the collector. "Above, bright green; labial margin, palate, tongue, and tympanum, lavender, the tympanum with a bar of green above; iris metallic reddish brown, pupil a horizontal slit; anal region light green; groins lavender; femora anteriorly and posteriorly green tinged with lavender; anterior edge of tibia narrowly tinged with reddish brown; anterior side of talus lavender extending on to first three toes and all webs; two outer toes green, lavender, and reddish brown; two outer webs striped mesially with green suffused with reddish brown; top of tarsus green followed by a narrow stripe of pale whitish lavender; rear and under side of tarsus dull lavender.

"Below, lower jaw edged with cream and lavender; throat and chin bright yellowish green; chest pale yellowish green; belly whitish tinged with lavender; forelimbs dull white; palms pale lavender; tibia mesially dirty white, dirty gray towards sides; femur pale greenish gray suffused with lavender; soles lavender." (W. H. Stickel).

This ♀ was taken in a foxhole at Toem, a second one as large was captured at night (2.ix.44) on the ground in a coconut grove; several very young examples in camp (4.x) or in a puddle in the grove (viii), on a young banana plant (i.ix), on a leaf in thicket (25.ix), while the only adult ♂ was caught when singing on the side of a tent (27.ix).

Hyla infrafrenata militaria (Ramsay)

Pelodryas militarius Ramsay, 1878, Proc. Linn. Soc. N. S. Wales, **2**, p. 28: New Ireland, New Britain Archipelago.

Hyla dolichopsis var. *pollicaris* Werner, 1898, Zool. Anz., **21**, pp. 554, 556: Ralum, New Britain Archipelago.

♀ (M. C. Z. 3580) New Britain (Australian Mus.) 1914.

Vomerine teeth between the choanae, head shorter than broad; snout once and a half times as long as the eye; interorbital space nearly twice as broad as an upper eyelid; tympanum half the eye diameter; outer finger two-thirds webbed; heel reaches beyond end of snout. Length of ♀, 125 mm.

As this frog apparently differs from *infrafrenata* only in its possession of a strongly projecting rudiment of pollex, it seems reasonable to regard it as the representative of that species in the New Britain Archipelago.

Hyla caerulea (Shaw)

Rana caerulea Shaw, 1790, in White, Journ. Voy. N. S. Wales, App., p. 248, pl. –: New South Wales (presumed, not stated).

Hyla irrorata de Vis, 1884, Proc. Roy. Soc. Queensland, **1**, p. 128: Gympie, Queensland.

Hyla gilleni Spencer, 1896, in Rep. Horn Sci. Exped., **2**, p. 173, pl. xv, figs. 14–17: Alice Springs, Central Australia.

8 (M. C. Z. 12151–7; U. S. N. M. 75985) Merauke, D. N. G. (P. T. L. Putnam) 1927.

Vomerine teeth between the posterior borders of the choanae; head shorter than broad; snout once and a quarter to once and a half as long as the eye; interorbital space once to once and a half times as broad as an upper eyelid; tympanum two-thirds to four-fifths the eye diameter; outer finger half-webbed; heel reaches tympanum or eye. Largest ♀ (M. C. Z. 12151), 86 mm., smallest frog (M. C. Z. 12152), 55 mm.

Though the Museum of Comparative Zoölogy has so little New Guinean material of *caerulea*, the species is represented in the collections by topotypes and frogs from ten Australian localities. From the brief description of the young frog that Macleay named *Litoria guttata*, long synonymized with *infrafrenata*, it seems just possible that the species was based on a young *caerulea*? Whether all the very young frogs from Aitape and Toem referred to *infrafrenata* (p.402)

are really that species and not *caerulea* has been carefully considered but cannot be said to be beyond question.

Hyla congenita Peters & Doria

Hyla (*Litoria*) *congenita* Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 247, pl. vi, figs. 4–5: Yule Island, British New Guinea.

♀ (M. C. Z. 11650) Upuli, B. N. G. (Brit. Mus.) 1925.

Vomerine teeth behind the level of the posterior borders of the choanae; head as long as broad; snout once and a quarter times as long as the eye; interorbital space once and a quarter times as broad as an upper eyelid; tympanum half the eye diameter; outer finger half-webbed; heel reaches eye. Length of gravid ♀, 35 mm.

Hyla becki Loveridge

Hyla becki Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 55: Mount Wilhelm, Bismarck Range, Madang Division, Australian New Guinea.

Type ♂ + 39 (M. C. Z. 25900–9) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Vomerine teeth between the posterior borders of the choanae; head as long as, or slightly longer than, broad; snout once and a half times as long as the eye; interorbital space once and a third times as broad as an upper eyelid; tympanum about half the eye diameter; outer finger without web; heel reaches eye or well beyond end of snout. Length of type ♂ (M. C. Z. 25900) 38 mm.

H. vagabunda Peters & Doria appears to be the nearest relative of *H. becki*.

Nyctimystes papua (Boulenger)

Nyctimantis papua Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 12, pl. i, fig. 5: Mount Victoria, Owen Stanley Mountains, British New Guinea.

Cotype ♀ (M. C. Z. 12838) Mt. Victoria, B. N. G. (Brit. Mus.) 1927.
5 ♂♂ (M. C. Z. 21816–20) Mondo, B. N. G. (L. E. Cheesman) 1934.

Vomerine teeth between the choanae; head as long as, or slightly shorter than, broad; snout once and a quarter times as long as the eye; interorbital space as broad as an upper eyelid; tympanum one-third to half the eye diameter even in the male series; outer finger one-third

(♂♂) to half-webbed (♀); heel reaches end of snout or beyond. Length of largest ♂ (M. C. Z. 21820), 51 mm., of gravid ♀, 55 mm.

Parker (1936, p. 77, fig. 78) discusses the Mondo series and his figure depicts the degree of webbing of the outer finger which I should call a third-webbed, attributing its contraction to preservation in too strong alcohol. In the ♀ cotype the webbing is clearly half, which would place it as *semipalmata* sp. n. in Parker's synopsis (p. 77), but it lacks the large lappet on the heel possessed by *semipalmata*. It will be noted also that I do not find the snout of *papua* as long as the eye.

Nyctimystes milneana Loveridge

Nyctimystes milneana Loveridge, 1945, Proc. Biol. Soc. Washington, **58**, p. 57: Milne Bay, Eastern Division, British New Guinea.

Type ♀ (M. C. Z. 11652) Milne Bay, B. N. G. (Brit. Mus.) 1925.

Vomerine teeth between the choanae; head slightly longer than broad; snout once and a half times as long as the eye; interorbital space narrower than an upper eyelid; tympanum two-thirds the eye diameter; outer finger half-webbed; heel reaches halfway between eye and end of snout. Length of gravid ♀, 48 mm.

Nyctimystes montana Parker

Nyctimystes montana Parker, 1936, Ann. Mag. Nat. Hist. (10), **17**, p. 80, fig. 4: Mondo, 5,000 ft., British New Guinea.

Paratype ♂♂♂ (M. C. Z. 21327–9) Mondo, B. N. G. (L. E. Cheesman) 1934.

Vomerine teeth between the choanae; head slightly longer than broad; snout once and a half times as long as the eye; interorbital space once and a quarter times as broad as an upper eyelid; tympanum half the eye diameter; outer finger half-webbed; heel reaches nostril or beyond end of snout. Length of largest ♂, 45 mm.

RANIDAE

[Platymantis corrugatus corrugatus (A. Duméril)]

Hylodes corrugatus A. Duméril, 1853, Ann. Sci. Nat. (3), **19**, p. 176: "Java."

Platymantis plicifera Günther, 1858, Cat. Batr. Sal. Brit. Mus., p. 95, pl. viii, fig. B: Philippines.

Rana rugata van Kampen, 1923, Amphibia Indo-Australian Archipelago, pp. 162, 190: nom. nov. for *corrugata* A. Dum., preoc. in *Rana*.

As Duméril in his description of *corrugatus* mentions this frog's large head it seems reasonable to assume that it came from the Philippines rather than the New Guinea region. Frogs from these two insular groups are undoubtedly subspecifically distinct, whether *Platymantis plicifera pelewensis* Peters, 1867, from the Pelew Islands, is a recognizable race, scarcely concerns us here.

Nor have I gone into the question whether *Platymantis* should be accorded only subgeneric status within the genus *Rana* as suggested by Van Kampen, a disposition with much in its favor. The large series of Philippine *corrugatus* in the Museum of Comparative Zoölogy do, however, clearly differ from our New Guinea material in possessing a

Head broader than, occasionally only as broad as, long; heel of adpressed hindlimb usually reaches well beyond end of snout through sometimes only to the loreal region; range: Philippine Islands ..... *P. c. corrugatus*

Head narrower than, occasionally as broad as, long; heel of adpressed hind limb reaches the eye (38%), loreal region (53%), rarely even to end of snout (9%); range: Molucca Islands and New Guinea ..... *P. c. papuensis*

Whether I am correct in applying *papuensis* Meyer, the earliest name available from this region, to the common coastal form of New Guinea must remain uncertain.

Platymantis corrugatus papuensis Meyer

Platymantis corrugatus var. *papuensis* Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 139: "Mysore" = Biak Island, Dutch New Guinea.

Cornufer moszkowskii Vogt, 1912, Sitzb. Ges. Naturf. Freunde Berlin, p. 358: Interior of Dutch New Guinea.

1 (M. C. Z. 2687) Ansoes Id., D. N. G. (T. Barbour) 1906.
1 (M. C. Z. 9375) New Guinea (Berlin Mus.) 1922.
4 (M. C. Z. 12959–62) Matapau, A. N. G. (E. A. Briggs) 1925.
6 (M. C. Z. 26030–5) Aitape, A. N. G. (W. M. Beck) 1944.
26 (M. C. Z. 26071–9) Toem, D. N. G. (W. H. Stickel) 1944.
2 (M. C. Z. 26080–1) Liki Id., D. N. G. (W. H. Stickel) 1944.
2 (M. C. Z. 26082–3) Gusiko, A. N. G. (D. Crocker) 1944.
1 (U. S. N. M. 119174) Milne Bay, B. N. G. (J. F. Cassel) 1944.
1 (U. S. N. M. 119175) Gusiko, A. N. G. (J. F. Cassel) 1944.
2 (U. S. N. M. 119197–8) Gusiko, A. N. G. (W. H. Stickel) 1944.
16 (U. S. N. M. 119209–24) Toem, A. N. G. (W. H. Stickel) 1944.
1 (U. S. N. M. 119530) Gamadodo, B. N. G. (G. H. Penn) 1944.

Tongue without, or with indistinct, papilla, except M. C. Z. 9375 and 12961; interorbital space as broad as, or narrower than, rarely broader than (for e.g. U. S. N. M. 119223) an upper eyelid; first finger extending beyond second; subarticular tubercles strongly developed; outer metatarsals united; tips of toes slightly, or well (M. C. Z. 26080–1) dilated. For variation in breadth of head and limb length see preceding key where the percentages refer to the 42 frogs from Toem only.

In life this Toem series evidently displayed considerable color variation, now somewhat obscured by formalin preservation. Of one deviscerated individual (No. 264, taken 23.vii.44) Stickel records: Above, gray; lips barred gray and cream. Below, light; yellowish patch at groin; postero-ventral surface of femur pale reddish orange; beneath tibia a bare trace of orange. This frog was 37 mm.; another of 30 mm. (No. 265, taken 23.vii.44) was: Above, mottled gray and tan; lips gray and cream; flanks yellowish tan. Below, belly faint yellowish; femur and tibia rosy. Femur and tibia of one gravid ♀ (M. C. Z. 26072, taken 21.vii.44) were suffused with reddish below, but other frogs ranged from reddish orange to yellow, even in a young one of 19 mm. (No. 240, taken 30.vi.44). In formalin most of the Toem frogs are uniform white below, the throat and chest of one ♂ is uniform dark gray, those of a dozen other frogs are more or less heavily mottled with brown.

Half-a-dozen of the Toem series display pale brown dorso-lateral lines corresponding to the striking color variants which occur in every large series and on which I believe the 56 mm. *Cornufer moszkowskii* Vogt was based. One of the Aitape series (M. C. Z. 26031) corresponds closely to the color description of *moszkowskii*, which may be translated as: Above, dark; snout to eyes light colored; back with a pair of reddish white dorsolateral streaks; lips spotted; limbs indistinctly barred. Below, yellow; chin and throat speckled with darker. Another frog (U. S. N. M. 119198) differs only in having the chin and throat white and unspotted.

The entire description of *papuensis* might be translated as follows: "Much more slender than the typical form and cherry red on top." It may be, therefore, that the name *papuensis* is not applicable to our series of gray frogs from localities along the north coast of Guinea all the way from Ansoes Island to Gamadodo, Milne Bay. In that event *moszkowskii* would be available and *rubrostriatus* might become a synonym of *papuensis* as their type localities are nearest.

I can find no characters on which to separate the Liki Island frogs

though the ♀ (M. C. Z. 26081), 65 mm. in length, is so much larger than (with the exception of M. C. Z. 9375, which is 60 mm.) the numerous gravid females (M. C. Z. 26031; U. S. N. M. 119213 for e.g.) which do not exceed 45 mm. The 13 mm. Ansoes Island frog is too small and dried for taxonomic studies.

Stickel remarks that these ground frogs are the "toads" of New Guinea, being found at times far from permanent water under trash in dry, partly cleared jungle; in open dry country; and in abandoned foxholes.

Platymantis corrugatus rubrostriatus (Barbour)

Cornufer corrugatus rubrostriatus Barbour, 1908, Proc. Biol. Soc. Washington, **21**, p. 190: Roon Island, Geelvink Bay, Dutch New Guinea.

2 (M. C. Z. 2441) Roon Id., D. N. G. (T. Barbour) 1906.

At the time this race was described its author was apparently unaware of *P. c. papuensis* Meyer from "Mysore" i.e. Biak Island, about 110 miles northeast of Roon Island but almost in the same latitude. As the brief description of *papuensis* (see above) makes no mention of the vertebral stripe which characterizes the Roon cotypes we must assume it was absent as is the case with 62 of the frogs referred to *papuensis* in this paper. The solitary exception is U. S. N. M. 119197 which, however, has light dorso-lateral stripes also and does not appear separable from the other four frogs from Gusiko. That this difference between the frogs of Roon Island and the main island should exist is the more surprising as Roon (Ron or Run) Island is so close to the western tip of Geelvink Bay.

None of the four structural characters mentioned by Barbour separate *rubrostriatus* from the mainland specimens (of which there were no examples in the Museum of Comparative Zoölogy when he wrote), but the shorter limb length of his cotypes (the adpressed heel reaches to the eye in one frog, to the loreal region in the other) serves to differentiate one from typical *corrugatus* of the Philippines.

Platymantis cheesmanae Parker

Platymantis cheesmanae Parker, 1940, Ann. Mag. Nat. Hist. (11), **5**, p. 257: Cyclops (= Cijcloop) Mountains, 3,000–4,000 feet, Dutch New Guinea.

Paratype (M. C. Z. 26501) Cyclops Mtns., D. N. G. (L. E. Cheesman) 1947.

This 23 mm. adult of a dwarf species whose gravid females measure only 27 mm., is adequately covered by Parker's full description of the type series.

Platymantis beauforti (van Kampen)

Cornufer beauforti van Kampen, 1913, Bijdr. t. d. Dierk., Pt. 19, p. 91: Bajon and Majalibit Bay, "Waigeu" i.e. Waigeo Island, Dutch New Guinea.

Cotype ♀ (M. C. Z. 10774) Majalibit Bay, D. N. G. (Amsterdam Mus.) 1925.

Tongue with papilla; head as broad as long; interorbital space as broad as an upper eyelid; first finger extending beyond the second; subarticular tubercles strongly developed; outer metatarsals united; tips of fingers and toes slightly dilated. Length of ♀, 60 mm.

As this species attains a length of 78 mm., and its dorsum is strikingly smooth in marked contrast to the local races of *corrugatus*, there seems little question of its specific distinctness. The sole character used to separate them by van Kampen (1923, p. 162) is that of the lingual papilla, of rather dubious value. On the strength of it, and size, I was at first inclined to regard the 60 mm. M. C. Z. 9375 as *beauforti* but rejected it on account of the presence of dorsal rugosities.

Platymantis boulengeri (Boettger)

Cornufer boulengeri Boettger, 1892, Kat. Batr. Mus. Senckenberg. Naturf. Ges. F. am M., p. 18: New Britain.

♀ (M. C. Z. 1729) New Britain (Godeffroy Mus.) 1880.
♀ (M. C. Z. 9372) New Britain (Berlin Mus.) 1892.

Tongue with cavity in place of papilla; interorbital space 1½ to 1¾ times as broad as an upper eyelid; head much broader than long; first finger extending beyond the second; subarticular tubercles strongly developed; outer metatarsals united; tips of fingers and toes slightly dilated. Length of both gravid ♀ ♀ *circa* 70 mm. Nematode worms in M. C. Z. 1729.

Rana daemeli (Steindachner)

Hylorana Daemeli Steindachner, 1868, Sitzb. Akad. Wiss. Wien, **57**, p. 532, pl. C: Cape York, Queensland.

Hylarana nebulosa Macleay, 1877, Proc. Linn. Soc. N. S. Wales, **2**, p. 135: Cape York, Queensland.

Hyla nobilis De Vis, 1884, Proc. Royal Soc. Queensland, **1**, p. 129: Cape York, Queensland.

♂ (M. C. Z. 9376) New Britain (Berlin Mus.) 1922.
♂ (M. C. Z. 9381) New Guinea (Berlin Mus.) 1922.
2 juv. (M. C. Z. 10761–2) Sabang, D. N. G. (Amsterdam Mus.) 1925.
2 hgr. (M. C. Z. 12965–6) Madang, A. N. G. (E. A. Briggs) 1925.
♂, hgr. (M. C. Z. 25873–4) Aitape, A. N. G. (W. M. Beck) 1944.
♀ (M. C. Z. 26218) Hollandia, D. N. G. (C. W. Moren) 1946.
5 juv. (M. C. Z. 26069–70) Toem, D. N. G. (W. H. Stickel) 1944.
3 juv. (U. S. N. M. 119225–7) Toem, D. N. G. (W. H. Stickel) 1944.

Adult males (M. C. Z. 9376, 9381, 25873) with internal vocal sacs and a humeral gland (obvious only in M. C. Z. 25873); distance between the thickened dorso-lateral glandular folds immediately behind the eyes equals the distance from the nostril to the posterior border of the eye; tympanum $^3/_5$ to $^3/_4$ the diameter of the eye from which it is separated by a distance equal to about half its own diameter; heel reaches the eye (Sabang; Madang; Aitape; Hollandia; 2 Toem), between eye and nostril (Sabang; Aitape; 3 Toem), nostril (Toem), or end of snout (New Britain; Madang; 2 Toem); tibia included in length of head and body 1.8 to 2.5 times; toes fully webbed (at least on one side) except the fourth which has the last two joints free or the penultimate phalange fringed with web.

Back gray-brown, pale brown, or reddish brown, with a characteristic double series of dark spots, at least on the hinder half, and often corresponding to raised warts. Below, white, but throat and breast in one male (M. C. Z. 25873) with dusky mottling, and one juvenile (M. C. Z. 10761) flecked with brown over the entire undersurface. Largest ♂ (M. C. Z. 9376), 70 mm., largest ♀ (M. C. Z. 26218) 82 mm.

The Museum of Comparative Zoölogy has no Australian material of *daemeli* which I (1935, p. 54) erroneously referred to the synonymy of *papua* with which it has repeatedly been confused. Indeed, *Rana florensis* Boulenger, of which we have specimens collected by Dunn, was made a subspecies of *papua* by Mertens (1927, p. 242) to which he later (1930, p. 225) referred Dunn's (1928, p. 6) frogs, is in reality a subspecies of *daemeli* and apparently cannot be regarded as a subspecies of *papua*. Attention is directed to the variation in limb length as exemplified by the Toem series, making this character of little use in keys though the hind leg of *daemeli* definitely averages shorter than that of *papua*

The Toem series (M. C. Z. 26069–70) were all taken in jungle — one in a deserted foxhole, another in a foxhole after a night of rain, a third in a temporary pool, and a fourth in Casuarina forest near the mouth of the Tor River.

Rana papua papua Lesson

Rana papua Lesson, 1830, Zool. in Duperry, Voyage autour du Monde . . . sur . . . La Coquille, **2**, p. 59, pl. vii, fig. 1: "Waigou" = Waigeo Island, Dutch New Guinea.

Rana fallax van Kampen, 1913, Nova Guinea, **9**, p. 458: "Waigeu" = Waigeo Island, Dutch New Guinea.

♂ ♀ (M. C. Z. 2703) Pom, Jobi Id., D. N. G. (T. Barbour) 1906.
4 hgr. (M. C. Z. 2704) Sorong, D. N. G. (T. Barbour) 1906.
♂ (M. C. Z. 2706) Manokwari, D. N. G. (T. Barbour) 1906.
2 ♀ ♀ (M. C. Z. 9379–80) New Guinea (Berlin Mus.) 1922.
hgr. (U. S. N. M. 57672) New Guinea (J. Hurter) 1913.

Adult males (M. C. Z. 2703, 2706) with external vocal sacs and humeral glands; distance between the narrow dorso-lateral glandular folds immediately behind the eyes equal to, or rather more than, the distance from the nostril to the posterior border of the eye; tympanum $^3/_5$ to $^3/_4$ the diameter of the eye from which it is separated by a distance equal to about half its own diameter; heel reaches to nostril (M. C. Z. 2703; 9379), end of snout (M. C. Z. 2704; 9380), or beyond (M. C. Z. 9380; U. S. N. M. 57672); tibia included in length of head and body 1.5 to 1.9 times; toes fully webbed except the fourth which has the last joint narrowly fringed.

Back brown, uniform or occasionally with a few scattered spots and raised warts of darker hue. Below, throat and chest white more or less distinctly marbled with brown leaving large white spots in adults (M. C. Z. 2703 ♀; 9379 ♀), the marblings sometimes extending to the belly (M. C. Z. 2704 — 2 ex.). In this connection Lesson's description reads: "Elle est blanche sous le cou, le thorax et le ventre." Largest ♂ (M. C. Z. 2706) 62 mm.; largest ♀ (M. C. Z. 2703) 72 mm.

Rana papua novaebritanniae Werner

Rana novae-britanniae Werner, 1894, Zool. Anz., **17**, p. 155: New Britain.

♂ (M. C. Z. 1730) New Britain Archipelago (Mus. Godeffroy) N. D.

Adult male with external vocal sacs and humeral glands; distance between the narrow dorso-lateral glandular folds immediately behind the eyes considerably more than the distance from the nostril to the posterior border of the eye; tympanum 7/9 the diameter of the eye from which it is separated by a distance about half its own diameter; heel reaches the eye; tibia included in length of head and body 2.2

times; toes fully webbed except the fourth which has the last joint narrowly fringed.

Back pale brown, uniform; throat, chest, and belly uniform white. Length of ♂, 76 mm.

Our specimen, like Roux's (1918, p. 411) was received as *Hyla nigrofrenata* Günther, a species described from Cape York, Queensland. Boulenger (1918, p. 241) had placed *novaebritanniae*, with a query, in the synonymy of *kreffti* Boulenger (1882, p. 64), and Roux (1918, p. 411) confirmed this disposition. He was followed by Boulenger (1920, p. 186) and van Kampen (1923, p. 206). Actually the white-bellied *Rana novaebritanniae* is perfectly distinct from the mottled-bellied *kreffti*, and its uniformly white underside appears to separate it also from *R. p. papua* Lesson.

Rana grisea grisea van Kampen

Rana grisea van Kampen, 1913, Nova Guinea, **9**, p. 460, pl. xi, fig. 3: Went Mountains, 1,300 metres, Dutch New Guinea.

♂ (M. C. Z. 23292) Mt. Misim, A. N. G. (H. Stevens) 1933.
2 juv. (M. C. Z. 25875–6) Aitape, A. N. G. (W. M. Beck) 1944.
2 ♀♀. 2 juv. (M. C. Z. 25877–9) Kundiawa, A. N. G. (P. J. Darlington) 1944.

Distance between the narrow dorso-lateral glandular folds immediately behind the eyes equals the distance from the nostril to the anterior border of the tympanum; tympanum ½ to ⅔ the diameter of the eye from which it is separated by a distance equal to *rather more than half* its own diameter; heel reaches the eye (M. C. Z. 25875), between eye and nostril (M. C. Z. 25876–7), end of snout (M. C. Z. 25879), or well beyond (M. C. Z. 25878); tibia included in length of head and body 1.6 to 1.75 times (Kundiawa) or 1.75 to 2 times (Aitape); toes fully webbed except the fourth which has the last joint narrowly or broadly fringed.

Back brown, uniform; throat and chest white heavily infuscated but leaving some white vermiculations showing on the chest which carries the pair of dark blotches common to many members of this group. Larger ♀ (M. C. Z. 25877), 96 mm. Length of ♂ (M. C. Z. 23292) 78 mm.

These New Guinea frogs are specifically identical with the Queensland material that I (1935, p. 54) erroneously referred to *R. p. papua* Lesson. One of them (M. C. Z. 18146) was a male with internal vocal

sacs and no sign of a humeral gland. In this connection it may be noted that van Kampen (1923, p. 208) says *grisea* has "large external vocal sacs and a humeral gland." As, however, his 1913 description of *grisea* was based on an 85 mm. ♀, this additional information was probably taken from Boulenger (1920, p. 186). But Parker (1936, p. 68) states that the three male frogs Boulenger (1920, p. 186) referred to *grisea* were actually *papua*, and that many of his "*papua*" were really *grisea*, hence my misidentification. By defining the differences between *papua* and *grisea* Parker has greatly clarified the situation. My material entirely agrees with his synopsis except in the four words italicized above. Parker's key calls for females with a tympanum separated from the eye "by a distance nearly equal to its own horizontal diameter" whereas in our series there is no material difference from *papua* in this respect.

Rana grisea milneana subsp. nov.

Type. United States National Museum No. 119173, a gravid ♀ from the Kwatto Branch Mission, 50 feet, Milne Bay, British New Guinea. Collected by Joseph F. Cassell.

Diagnosis. Differs from *Rana grisea* van Kampen (which was described as having only a narrow fringe of web on the terminal phalange of the fourth toe, as is the case with our series of *grisea*) in (1) the more extensive webbing of the fourth toe on which it extends quite broadly to the disk, especially on the outer side; (2) the tympanum being separated from the eye by a distance equal only to a third of the tympanic diameter; (3) first finger extending well beyond second; (4) the smaller size, being gravid at 80 mm., instead of 96 mm.

Description. Vomerine teeth in two oblique series between, but extending backwards behind the level of, the choanae; head longer than broad; snout pointed, projecting; nostril nearer end of snout than orbit, the distance from nostril to orbit being as long as the orbit; canthus rostralis strong; loreal region concave; interorbital space much narrower than an upper eyelid; distance between the dorsolateral folds behind the eyes equal to the distance from nostril to tympanum; tympanum seven-tenths that of orbit from which it is separated by a distance equal to one third its own diameter.

Disks of fingers and toes small, first finger extending well beyond second, which is shorter than the fourth; fifth toe longer than the third, toes, *including* the fourth, webbed to disks; outer metatarsals separated to their base by web; subarticular tubercles well developed;

a distinct, elliptic, inner, and a low, round, outer, metatarsal tubercle; no tarsal fold; the tibio-tarsal articulation of the adpressed hind limb reaches the snout; tibia 1.6 times in length of head and body. Skin above, smooth and without warts, a narrow dorso-lateral fold.

Color in alcohol after formalin. Above, purplish plumbeous, uniform on head and back; loreal, tympanum, and temporal region dark brown; some irregular, light-edged, black marks in groin; about a dozen dark crossbars on each hind limb. Below, buccal border mottled with darker and lighter; throat and forearm white, uniform except for a pair of streaks (common to members of this formenkreis) on the chest, a few flecks about base of forearms and a dark streak on the anterior base of each forearm; belly and thighs yellowish, uniform.

Size. Length of head and body of adult ♀, 80 mm.

Rana arfaki Meyer

Rana Arfaki Meyer, 1874, Monatsb. Akad. Wiss. Berlin, p. 138: Arfak Mountains, Dutch New Guinea.

Rana macroscelis Boulenger, 1888, Ann. Mag. Nat. Hist. (6), **1**, p. 345: "Sogere" i.e. Sogeri Camp, 1,750 feet, British New Guinea.

? ♀ (M. C. Z. 9371) New Guinea (Berlin Mus.) 1922.
♀ (M. C. Z. 11637) Haveri, B. N. G. (Brit. Mus.) 1925.

Head as broad as long; tympanum ½ to ⅗ the diameter of the eye from which it is separated by a distance about equal to its own diameter; no dorso-lateral glandular folds; first finger extending beyond second; dilations of fingers and toes with a lateral crescentic groove; tibia included in length of head and body 1.6 to 1.8 times; toes fully webbed to disks. Sides of head not darker than upper surface. Larger ♀ (M. C. Z. 11637), 150 mm.; type was 115 mm., cotype of *macroscelis* 140 mm.

The first specimen was received from Berlin as *arfaki*, the second from the British Museum as *macroscelis*. Parker (1935, p. 71) who may have seen the type of *waigeënsis*, has expressed doubts regarding its usual disposition as a strict synonym of *arfaki*, noting a relatively smaller tympanum in van Kampen's species. However, the description of the 36 mm. type agrees well with our 150 mm. female except that in the latter (a) the lower jaw *is* denticulated; (b) the snout is *longer* than the orbit; (c) the terminal phalange of the fourth toe *is* webbed to the disk as in van Kampen's (1913, pl. xi, fig. 2) figure, which contradicts the description; (d) the heel extends *beyond* the end of the snout, instead of falling short of the end, a matter of little significance.

BREVICIPITIDAE

Genyophryne thomsoni Boulenger

Genyophryne thomsoni Boulenger, 1890, Proc. Zool. Soc. London, p. 327, pl. xxv, fig. 1: "Sudest Island," i.e. Tagula Island, British New Guinea.

1 (M. C. Z. 11646) Albert Edward Mtns., B. N. G. (Brit. Mus.) 1925.

Vomerine odontoids present; two transverse palatal ridges, the posterior serrate; tongue notched and free behind. Length 33 mm. One of the series collected at 6,000 feet by Rohu.

Xenobatrachus rostratus (Méhely)

Choanacantha rostrata Méhely, 1898, Termés. Füzetek, **21**, p. 175, pl. xii: Erima, Astrolabe Bay, Australian New Guinea.

1 (M. C. Z. 9378) Australian New Guinea (Berlin Mus.) 1922.

A pair of high, conical, vomerine odontoids present; a single palatal ridge, strongly serrate; tongue entire, not noticeably free behind. Length 42 mm.

Asterophrys rufescens (Macleay)

Hylophorbus rufescens Macleay, 1878, Proc. Linn. Soc. N. S. Wales, **2**, p. 136: "Katow," = Binaturi River, British New Guinea.

Mantophryne lateralis Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 12, pl. ii, fig. 3: Mount Victoria, Owen Stanley Mountains, British New Guinea.

1 (M. C. Z. 2894) Albert Edward Mtns., B. N. G. (Brit. Mus.) 1912.
1 (U. S. N. M. 12465) Toem, D. N. G. (W. H. Stickel) 1944.

No vomerine odontoids; two palatal ridges, the anterior curved, smooth, the posterior serrate; tongue entire, not noticeably free behind; a pair of mental tubercles; tympanum two-thirds the eye diameter; digital disks small. Length 40–42 mm.

The color in life of the Toem frog is described by Stickel as: Above, a mixture of brown and clay, a black dorsolateral band, upper lip, hind arm and flanks clay, the lip and forearm banded with blackish brown; hind limbs light orange-yellow with orange-gold spots. Below white suffused with gray, especially anteriorly, and spotted with black; soles gray.

Asterophrys valvifera (Barbour)

Pomatops valvifera Barbour, 1910, Proc. Biol. Soc. Washington, **23**, p. 89, pl. i: Fakfak, Dutch New Guinea.

Type (M. C. Z. 2577) Fakfak, D. N. G. (A. E. Pratt) N. D.

Two palatal ridges, the anterior curved, smooth, the posterior serrate; tongue entire, slightly free behind; no mental tubercles; tympanum indistinct; digital disks small; chin and throat brown, spotted with white, *only* breast and belly immaculate. Length 32 mm.

The frog from Mafulu, 4,000 feet, referred to this species by Parker (1936, p. 73) with some misgivings, actually appears to resemble the type in the coloring of the underside.

Asterophrys robusta (Boulenger)

Mantophryne robusta Boulenger, 1898, Proc. Zool. Soc. London, p. 480, pl. xxxviii, fig. 4: "St. Aignan Island," = Misima Island, British New Guinea 1 (M. C. Z. 9386) New Guinea (Berlin Mus.) 1922.

Two palatal ridges, the anterior curved, smooth, the posterior serrate; tongue feebly nicked, not noticeably free behind; no mental tubercles; tympanum *distinct*, slightly more than half the eye diameter; digital disks small; heel reaches nostril; chin and breast fuscous breaking up into spots on side of belly. Length 41 mm.

Asterophrys pansa pansa (Fry)

Aphantophryne pansa pansa Fry, 1917 (1916), Proc. Linn. Soc. N. S. Wales, **41**, p. 772, pl. liv, and lv, fig. 2: Mount Scratchley, Owen Stanley Mountains, British New Guinea.

Paratype (M. C. Z. 26223) Mt. Scratchley, B. N. G. (A. Guilianetti) 1896.

Snout rounded, scarcely prominent, slightly *longer* than the eye diameter; interorbital space *twice* as broad as an upper eyelid; tympanum slightly distinct, about two-thirds the eye diameter; third toe considerably longer than the fifth. Length 22 mm.

When attempting to determine the generic status of the frogs described below, I observed that the pre-pharyngeal palatal ridges were curved in the reverse direction to that figured by Fry (1917, pl. liv, fig. 1b) for his genus *Aphantophryne*. Nor was the anterior ridge

serrated to anything like the extent shown, being almost smooth, while on the second ridge the serrations were even more sharply defined. Fry also shows (figs. 1c–1d) the terminal phalange of the fourth toe as pronouncedly T-shaped, whereas it is only club-shaped as might be anticipated in a frog whose habitus suggests terrestrial habits.

However, feeling sure that our frogs represented the same species, I wrote to Mr. J. Roy Kinghorn at the Australian Museum for further information. He agreed with me that Fry was at fault in drawing the palatal ridges with forward-directed curves, instead of backward; and stated that the terminal phalanges depicted as T-shaped should be club-shaped or nodular. He kindly sent me the paratype listed above which I have not dissected.

I communicated these findings to Mr. H. W. Parker and he pointed out that there were now no grounds for maintaining *Aphantophryne* as distinct from *Asterophrys*, furthermore the two Mount Wilhem specimens submitted (and now in the British Museum) agreed very closely with the description of *Asterophrys minima* Parker of which the only known examples are in the Amsterdam Museum. Mr. Parker suggested sending the recently acquired British Museum paratype of *pansa* to Dr. L. D. Brongersma for comparison with the types of *minima* and later forwarded Dr. Brongersma's views on their status, which were as follows.

"As far as I can judge the two species are distinct. I find the following differences: In *pansa* the snout is about equal to the diameter of the orbit, while in *minima* it is distinctly longer. The snout of *minima* is more pointed and more prominent. The canthus rostralis in *pansa* is more marked, the loreal region being more vertical. In *minima* the canthus rostralis is more rounded, the loreal region much more oblique. In *pansa* the interorbital breadth is greater; this difference is somewhat difficult to express in words, as in *minima* there is some difference between the type and the paratype. In the the type of *minima* the upper eyelid is broader than the interorbital space, in the somewhat shrunken paratype the upper eyelid is slightly narrower than the interorbital space. Placing the specimens side by side, I find that the interorbital space in *pansa* makes the impression of being much broader relatively. The anterior palatal ridge seems to be much more developed in *pansa* than in *minima*. There may be a slight difference in the shape of the coracoids too. The anterior border of the coracoid in *pansa* shows a more marked forward curve near its medial border than in *minima*."

Some of the above differences are shown to be within the range of a subspecies by the long series of frogs from Mount Wilhelm described

below, in view of this I prefer to regard *minima* as a third montane race.

Asterophrys pansa wilhelmana subsp. nov.

Type. Museum of Comparative Zoölogy, No. 25910, a gravid ♀ from Mount Wilhelm, 8,000 feet, Bismarck Range, Madang Division, Australian New Guinea, collected by Captain P. J. Darlington, Jr., October, 1944.

Paratypes. Museum of Comparative Zoölogy, Nos. 25911–9, the last of which is now in the Australian Museum, and two uncatalogued specimens in the British Museum, all with the same data as the type.

Diagnosis. Differs from the typical form and *A. p. minima* in the snout being truncate at tip; from *pansa* in the much narrower interorbital space, and from *minima*, of which the type female was adult at 27 mm., in being double the size. The type of *p. pansa* was also 27 mm. but Fry did not state if it is adult.

Description. Snout truncate at tip, (equal to or) slightly longer than the eye diameter; canthus rostralis rounded; loreal region slightly oblique, concave; interorbital space as broad as, or narrower than, an upper eyelid; tympanum distinct or indistinct, about three-fifths the eye diameter; fingers and toes without disks, first finger shorter than the second, which is slightly shorter than the fourth; toes short, the third considerably longer than the fifth; subarticular tubercles not developed, a very weak inner, but no outer, metatarsal tubercle; tibiotarsal articulation of the adpressed hind limb reaches the axilla or shoulder.

Color in life. Recorded by Dr. Darlington as "dark slate." Substantially the same in alcohol; below, paler.

Size. Type ♀ (M. C. Z. 25910), 50 mm. Smallest paratype (M. C. Z. 25912), 11 mm.

Habitat. Taken beneath logs in the forest at 8,000 feet (P. J. D.).

Asterophys oxycephala (Schlegel)

Bombinator oxycephalus Schlegel, 1858, Handl. Dierk., **2**, p. 58, pl. iv, fig. 74: New Guinea.

?*Xenorhina stresemanni* Ahl, 1932, Mitt. Zool. Mus. Berlin, **17**, p. 897: Jobi = Japen Island, Dutch New Guinea.

♀ (M. C. Z. 7610) Humboldt Bay, D. N. G. (P. N. van Kampen) 1921.

A single palatal ridge, serrate; tongue entire, not free behind; no mental tubercles; tympanum indistinct, about equal to the eye diam-

eter, which is half the length of the snout; digital disks small; heel reaches tympanum. Length 41 mm.

Color in life violet gray above; throat, belly, and underside of thighs brick red, according to van Kampen who collected it in a spring brook on south shore of the Bay, 26.i.1910.

Metopostira ocellata Méhely

Metopostira ocellata Méhely, 1901, Térmés. Füzetek., **24**, pp. 190, 239, pls. vii, xii, fig. 1: Sattelberg, Australian New Guinea.

Metopostira macra van Kampen, 1906, Nova Guinea, **5**, p. 167, pl. vi, figs. 1–2: "Am Moso und Tami," i.e. Mosso River, Australian New Guinea.

1 (M. C. Z. 7612) Humboldt Bay, D. N. G. (P. N. van Kampen) 1921.
1 (M. C. Z. 9377) Australian New Guinea (Berlin Mus.) 1922.
1 (M. C. Z. 12958) Matapau, Wakip R., A. N. G. (E. A. Briggs) 1923.

Two palatal ridges, the anterior curved, smooth, the posterior serrate; tongue entire, not or scarcely free behind; snout shorter or slightly *longer* than the eye diameter; tympanum distinct or indistinct in adult, about three-quarters the eye diameter; digital disks of fingers small, of toes moderate. Length 32–37 mm. The Matapau frog was taken beneath a stone near running water, January, 1923.

Baragenys cheesmanae Parker

Baragenys cheesmanae Parker, 1936, Ann. Mag. Nat. Hist. (10), **17**, p. 66, fig. 1: Mt. Tafa, 8,500 feet, British New Guinea.

Paratype (M. C. Z. 19921) Mt. Tafa, B. N. G. (L. E. Cheesman) 1934.

The genus *Baragenys*, of which *cheesmanae* is genotype, was erected by Parker (1936) to include *Hylophorbus kopsteini* Mertens and *Xenorhina atra* Günther, formerly assigned to *Metopostira* by Parker (1934).

Sphenophryne cornuta Peters & Doria

Sphenophryne cornuta Peters & Doria, 1878, Ann. Mus. Civ. Stor. Nat. Genova, **13**, p. 430, pl. vii, fig. 4: "flumen Wa Samson," = Wasemsan River, Dutch New Guinea.

Chaperina ceratophthalmus van Kampen, 1909, Nova Guinea, **9**, p. 43, pl. ii, fig. 8: "Noord Fluss" = Lorentz River, near Geitenkamp and Resi Peak, Dutch New Guinea.

1 (M. C. Z. 7611) Kohari Mtns., D. N. G. (P. N. van Kampen) 1921.

Snout longer than eye; upper eyelid with spinelike tubercle; disks of fingers larger than those of toes; heel reaches tympanum. Length 34 mm. Additional data is contained on the collector's label which reads "between Modder-lust and Kasawari," two localities I have failed to find.

Sphenophryne schlaginhaufeni Wandolleck

Sphenophryne schlaginhaufeni Wandolleck, 1911, Abhand. Ber. König. Zool. Mus. Dresden, **13**, No. 6, p. 5, figs. 10–17: Upper reaches of Rienjamur, 650–700 metres, Torricelli Mountains, Australian New Guinea.

Sphenophryne klossi Boulenger, 1914, Trans. Zool. Soc. London, **20**, p. 251, pl. xxvii, figs. 3–3b: Launch Camp, Setekwa River, Dutch New Guinea.

1 (M. C. Z. 26219) Aitape, A. N. G. (W. M. Beck) 1944.
1 (U. S. N. M. 124646) Toem, D. N. G. (W. H. Stickel) 1944.

Snout longer than eye; canthus rostralis angular; upper eyelid normal; disks of fingers smaller than those of toes; heel reaches nostril (Aitape) or eye (Toem). Length 24–26 mm. The Toem frog is very nearly topotypic.

Sphenophryne macrorhyncha (van Kampen)

Chaperina macrorhyncha van Kampen, 1906, Nova Guinea, **5**, p. 168, fig. 3: Manikion District, Dutch New Guinea.

Chaperina basipalmata van Kampen, 1906, Nova Guinea, **5**, p. 169, figs. 4–5: Tawarin and Timena River, Dutch New Guinea.

Chaperina quatuorlobata Wandolleck, 1911, Abhand. Ber. König. Zool. Mus. Dresden, **13**, No. 6, p. 9, figs. 34–36: Torricelli Mountains, Dutch New Guinea.

Chaperina punctata van Kampen, 1913, Nova Guinea, **9**, p. 643, pl. xi, fig. 7: Went Mountains, 800–1,050 metres, and Hellwig Mountains, 2,500 metres, Dutch New Guinea.

1 (M. C. Z. 9383) New Guinea (Berlin Mus.) 1922.
Paratype (M. C. Z. 10773) Went Mtns., D. N. G. (Amsterdam Mus.) 1925.

Snout as long as eye; canthus rostralis rounded; disk of third finger twice as broad as penultimate phalange, slightly larger than those of toes; heel reaches tympanum (M. C. Z. 9383) or eye. Length 25–31 mm. The smaller frog, taken 11–12.x.09 by the Dutch New Guinea Expedition, is a paratype of *C. punctata*.

Sphenophryne brevicrus (van Kampen)

Oxydactyla brevicrus van Kampen, 1913, Nova Guinea, **9**, p. 465, pl. xi, fig. 8: Hellwig Mountains, 2,500 metres, and Wichman Mountains, 3,000 metres, Dutch New Guinea.

19 (M. C. Z. 25920–9) Mt. Wilhelm, A. N. G. (P. J. Darlington) 1944.

Except for the tympanum being two-thirds the eye diameter in adults, and the third toe being considerably (instead of "a little") longer than the fifth, these frogs agree reasonably well with Parker's (1934) description. Our largest are 3 mm. shorter than the type. Length of ♂ (M. C. Z. 25925), 27 mm., of a spent ♀ (M. C. Z. 25920) 27 mm.

The coloration is amazingly variable. Above, pinkish, heavily overlaid with purplish black, through every gradation to those with a mottled crown and almost uniform fawn colored back bordered by a black stripe extending from end of snout through nostril and eye to below groin. Besides a great variety of spotting and marbling, the young sometimes display a heavily black-edged, white, V-shaped mark whose apex is directed to the anus. Below, white, uniform or lightly speckled or heavily marbled with black so that the throat is very largely black.

Found between 10,000 and 12,000 feet above timber line in shallow recesses under tussocks. One, together with 14 eggs, each about 5 mm. in diameter, was taken in moss under a tussock at 11,000 feet. A woodeny croaking call, presumably produced by this species, was heard as high as 13,000 feet (P. J. D.).

Oreophryne anthonyi (Boulenger)

Sphenophryne anthonyi Boulenger, 1897, Ann. Mag. Nat. Hist. (6), **19**, p. 10, pl. ii, fig. 1: Mount Victoria, Owen Stanley Mountains, British New Guinea.

Cotype (M. C. Z. 2896) Mt. Victoria, B. N. G. (Brit. Mus.) 1912.

Snout slightly longer than the eye diameter; tympanum about half the eye diameter; disks of fingers about thrice as broad as the penultimate phalanges, the third about three-quarters the eye diameter; toes webbed, the fifth longer than the third. Length 40 mm.

Oreophryne biroi (Méhely)

Sphenophryne biroi Méhely, 1897, Termés. Füzetek, **20**, pp. 400, 411, pl. x, figs. 3–6: "Friederich-Wilhelmshaven" = Madang, Australian New Guinea.

Sphenophryne loriae Boulenger, 1898, Ann. Mus. Civ. Stor. Nat. Genova, (2), **18**, p. 707, pl. viii, fig. 3: Moroka, British New Guinea.

?*Sphenophryne mertoni* Roux, 1910, Abhand. Senckenberg. Naturf. Ges., **33**, p. 227: Samang, Wokam, Aru Islands.

Mehelyia lineata Wandolleck, 1911, Abhand. Ber. König. Zool. Mus. Dresden, **13**, No. 6, p. 7, figs. 18–26: "Sacksackhütte," Torricelli Mountains, Australian New Guinea.

Mehelyia affinis Wandolleck, 1911, Abhand. Ber. König. Zool. Mus. Dresden, **13**, No. 6, p. 8, figs. 27–35: Torricelli Mountains, Australian New Guinea.

1 (M. C. Z. 3498) Ferguson Id., B. N. G. (Brit. Mus.) 1914.
5 (M. C. Z. 26220–2) Aitape, A. N. G. (W. M. Beck) 1944.
1 (U. S. N. M. 113199) Gusiko, A. N. G. (J. M. Kern) 1944.

Snout as long as the eye diameter; tympanum about one-third the eye diameter; disks of fingers twice as broad as penultimate phalanges; toes webbed, the fifth longer than the third. Length ♂ (M. C. Z. 26220) 21 mm., ♀ (U. S. N. M. 113199) 24 mm.

Cophixalus geislerorum Boettger

Cophixalus geislerorum Boettger, 1892, Kat. Batr. Mus. Senckenberg. Naturf. Ges., p. 24: "Kaiserwilhelmsland," = Australian New Guinea.

2 (M. C. Z. 12963–4) Matapau, A. N. G. (E. A. Briggs) 1923.

Snout *as long as* the eye diameter; inner finger three-quarters the length of second, with a large disk; disks of fingers slightly larger than those of toes; toes slightly webbed at base, the third not extending as far as the fifth; heel reaches the shoulder. Lengths 23–28 mm. Taken near running water in Sago Palm Forest.

Cophixalus biroi darlingtoni subsp. nov.

Type. Museum of Comparative Zoölogy, No. 25930, a gravid ♀ from Toromanbanau, 7,500 feet, Bismarck Range, Madang Division, Australian New Guinea, collected by Captain P. J. Darlington, Jr., October, 1944.

Paratypes. Museum of Comparative Zoölogy, Nos. 25931–9, and forty others of which a pair are now in the Australian Museum and a pair in the British Museum.

Diagnosis. Agrees with Parker's redescription of the typical form from Sattelberg in most respects, but differs in the third toe being slightly shorter (not "much longer") than the fifth (all fifty frogs the same); in the tympanum being half (not "about one third") the eye diameter (a dozen examined); in having a markedly rugose (not "smooth") skin; and while all have a dark streak from the posterior corner of the eyelid extending almost to the shoulder, in none is it continued as a dark streak along the side of the body, nor do any exhibit dorso-lateral lines.

It might be added that while the snout *is* "somewhat longer" (often considerably longer) than the eye diameter in the great majority (thirty-seven) of the series, the snout *equals* the eye diameter in thirteen frogs (including M. C. Z. 25931, 25935–7).

From *C. variegatus* (van Kampen) from Digul River, Dutch New Guinea, *darlingtoni* differs in the third toe being slightly (not "distinctly") shorter than the fifth; while the tibio-tarsal articulation of the adpressed hind limb fails to reach the axilla in gravid females, in all the rest it reaches the shoulder or tympanum (not "the eye"); it differs also in its warty (not "smooth") skin, and possibly in size (the type of *variegatus* was 18 mm., our example 17 mm.).

Size. Type ♀ (M. C. Z. 25930), 27 mm., a dozen gravid paratype ♀ ♀ range from 22–26 mm., a dozen baggy-throated paratype ♂ ♂ from 19–23 mm., the youngest specimen is 17 mm.

Remarks. This fine series of beautifully preserved frogs is named for the collector, Dr. P. J. Darlington, Jr., of the Museum of Comparative Zoology, who has done so much to advance our knowledge of the herpetology of the Bismarck Range.

Cophixalus verrucosus (Boulenger)

Sphenophryne verrucosus Boulenger, 1898, Ann. Mus. Civ. Stor. Nat. Genova (2), **18**, p. 707, pl. viii, fig. 2: Mount Victoria, Owen Stanley Mountains, British New Guinea.

♂ (M. C. Z. 3496) Ferguson Id., B. N. G. (Brit. Mus.) 1914.

Snout rounded, longer than the eye diameter; inner finger with a small disk, about half the length of second; disks of other fingers scarcely larger than those of toes; toes free, the third extending beyond the fifth; heel reaches the nostril. Length 24 mm.

Copihixalus variegatus variegatus (van Kampen)

Hylophorbus variegatus van Kampen, 1923, Amphib. Indo-Australian Archip., p. 138: Digul (Digoel) River, Dutch New Guinea.

1 (M. C. Z. 9385) New Guinea (Berlin Mus.) 1922.

Snout obtusely pointed, as long as the eye diameter; tympanum less than half the eye diameter; inner finger about half the length of the second, which is slightly longer than the fourth; disks of fingers larger than those of toes; toes free, the third not extending as far as the fifth; heel reaches the tympanum (not eye). Length 17 mm.

Agrees closely with Parker's (1934, p. 176) description of external characters, but, being pale brown flecked with darker, does not conform to the color description. Received from Berlin as *Hylophorbus boettgeri* (Méhely) of Halmaheira, a species that Parker (1934, p. 61) refers to *Asterophrys*.

Cophixalus variegatus parkeri subsp. nov.

Type. Museum of Comparative Zoölogy, No. 25940, a gravid ♀ from Mount Wilhelm, 8,000 feet, Bismarck Range, Madang Division, Australian New Guinea, collected by Captain P. J. Darlington, Jr., October, 1944.

Diagnosis. Differs from the typical form in having an angular canthus rostralis; an interorbital space as broad as (not "broader than") an upper eyelid; a tympanum only half (not "nearly two-thirds") the eye diameter; third toe as long as (not "very distinctly shorter than") the fifth; skin of dorsum with scattered tubercles (not "smooth"); no broad crossbar on femur, tibia, or tarsus; and possibly greater size.

Description. Snout obtusely pointed, slightly prominent, as long as the eye diameter; canthus rostralis angular; loreal region vertical, slightly concave; interorbital space as broad as an upper eyelid; tympanum distinct, half the eye diameter; disks of fingers large, truncate distally, first finger much shorter than the second which is about as long as the fourth; toes *long*, free, their disks slightly smaller than those of the fingers, the third as long as the fifth; subarticular tubercles developed; no metatarsal tubercles; tibio-tarsal articulation of the adpressed hind limb reaches almost to the eye.

Skin smooth with scattered tubercles, a fine, raised line from snout to anus; a W-shaped, raised glandular marking on scapular region.

Color. Above, plumbeous, a broad, light, transverse bar unites the upper eyelids anteriorly; sides of head as far as tympanum dark; from tympanum to groin, and on the basal part of fore and hind limbs, creamy white variegated with darker. Below, throat dark brown; breast, belly and limbs creamy white with dusky mottling; subarticular tubercles and disks mostly white.

Size. Type ♀, 28 mm.

Remarks. This unique specimen was submitted to Mr. H. W. Parker who agrees that it is near *variegatus,* but as the species is not represented in the British Museum he ventures no opinion on the significance of the characters by which I have separated it.

Cophixalus oxyrhinus (Boulenger)

Phrynixalus oxyrhinus Boulenger, 1898, Proc. Zool. Soc. London, p. 480, pl. xxxviii, fig. 3: "St. Aignan Island," = Misima Island, British New Guinea.

1 (M. C. Z. 9387) New Guinea (Berlin Mus.) 1922.

Disks of fingers smaller than those of toes. Length 22 mm.

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THE EFFECT OF LIGHT INTENSITY AND DAY LENGTH ON REPRODUCTION IN THE ENGLISH SPARROW

By George A. Bartholomew, Jr.

With Ten Plates

CAMBRIDGE, MASS., U.S.A.
PRINTED FOR THE MUSEUM
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No. 3—*The Effect of Light Intensity and Day Length on Reproduction in the English Sparrow*

By George A. Bartholomew, Jr.

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Cambridge, Massachusetts

I. INTRODUCTION

This study was planned as an investigation of the role of daylight in the timing of seasonal reproduction in an animal of the temperate zone. With the English sparrow, *Passer domesticus*, as the experimental animal, it was proposed first, to obtain a quantitative evaluation of the effects of different intensities of light when applied during days of the same length, and second, to obtain a quantitative evaluation of the effects of different day lengths during which the same intensity of light was used. Having determined the effects of day length and light intensity under laboratory conditions, it was planned to attempt to interpret their roles in nature.

The author is indebted to Dr. G. L. Clarke for helpful guidance and stimulating criticism, which contributed much to the completion of this work.

Reproduction in most animals and plants of the temperate zones is seasonal and the study of the effects of environmental factors on seasonal sexual cycles has long been a productive line of research. One of the most striking results of this line of investigation has been the establishment of the importance of day length in the timing of sexual periodicity.

Despite the fact that the control of sexual activity by day length has been repeatedly demonstrated in birds, the main features of avian photoperiodism under laboratory conditions have been only partially delineated and the role of photoperiodism under natural conditions remains almost completely unknown.

It has long been known, see the reviews of Bissonnette (1936, 1937), Rowan (1938), and Marshall (1936, 1942), that the effect of light on the sexual activity of birds can be modified by its intensity and wave-

length as well as its daily period. Since in nature, the variation in wave-length can in most instances probably be ignored, the two main factors involved in avian photoperiodism under natural conditions must be day length and light intensity, each of which is dependent on the other and both of which, even in the absence of other environmental factors, can be modified by internal physiological rhythms.

The English sparrow was selected as the experimental subject because it is available at all seasons, takes well to captivity, and has a strong photoperiodic response. Moreover, with the exception of the starling, the English sparrow is the most thoroughly studied of passerine birds from the point of view of endocrinology. In addition, since Kirschbaum and Ringoen (1936) have shown that external temperature does not effect its sexual cycle and Riley (1940) and Kendeigh (1941) have shown independently that it is the daily period of light and not the daily period of activity which controls its sexual development, there can be little doubt that light is the primary external factor which controls the sparrow's sexual periodicity.

The plan of the experiments carried out in this investigation is briefly summarized below.

1. *Intensity.* In order to get a quantitative evaluation of the effect of light intensity, sparrows were subjected during uniformly long days to light of 5 different intensities for periods ranging from less than two weeks to more than 12 weeks and then killed for the examination of the reproductive condition.

2. *Day Length.* To determine the effects of different day lengths, groups of male and female sparrows were exposed to the same intensity of light for daily periods of 10, 12, 14, 16, and 24 hours and then examined for gonadal development. To test whether or not high intensity of light could be substituted for day length, males were exposed to daily periods of light about ½ hour longer than the shortest day of the year at two intensities, one high and one low, but both within the range known to be effective.

3. *Internal Rhythms.* The investigation of internal rhythms was incidental to the study of light intensity and day length and was confined to two experiments. Females were kept on uniform day lengths of 8 hours during winter and spring, the seasons of gonadal growth, and examined at intervals for signs of sexual development. Males were exposed during the winter and again in the fall to the same intensities of light during similar daily periods for the same number of days and the gonadal development obtained in the two seasons compared.

II. REPRODUCTION AND PHOTOPERIODISM IN THE ENGLISH SPARROW

The annual reproductive cycle of the English sparrow has been studied in Iowa by Keck (1934), in Minnesota by Kirschbaum and Ringoen (1936) and in Oklahoma by Allender (1936a, 1936b). Except for slight differences in time which are probably associated with the differences in latitude of the places in which they made their studies, all these authors report the same situation. In the male, gonads are of minimum size during the fall, germinal activity begins sometime during January and full reproductive competence is reached during the month of March and maintained until midsummer when the testes start to involute. The cycle of the female resembles that of the male except that the female reaches reproductive competence several weeks later in the spring.

The earliest work on the photoperiodic response of the English sparrow was that of Kirschbaum (1933) who found that during October, November, and December, the extension of day length by the addition of 6 or 7 hours of artificial light after sunset induced gonadal recrudescence in males and that the artificial reduction of day length during the winter and spring did not invariably cause complete repression of testicular activity.

Kirschbaum and Ringoen (1936) verified the findings reported above and in addition found that response was greater in January than in October and November. Riley (1936) showed that the males which had bred the previous spring showed no response to an increase in hours of light started in September, even after 50 days, while immature birds hatched the previous spring showed a marked response. Adult males which had bred the previous spring, however, showed a strong response when subjected to artificially increased day lengths starting November 18.

Riley and Witschi (1938) showed that the female English sparrow also responds to artificially increased day length, but that light alone is not sufficient to produce ovulation and that the response is much slower than in the male. They found that both juvenile and adult females are partially refractive in September and October, but not in winter and spring. Their findings were confirmed by Ringoen and Kirschbaum (1939). Kirschbaum, Pfeiffer et al (1939) showed that the limited ovarial reaction is due not to the insensitivity of the female pituitary to light, but to the fact that the ovary has a relatively higher threshhold for response to gonadotropic hormones than has the testis.

That factors other than light must be important in the reproductive cycle of the female English sparrow is apparent from the preceding discussion, but definite proof was not available until 1940 when Polikarpova demonstrated the importance of behavioral factors in the induction of reproductive activity of the female English sparrow. He reported that during the winter, if in addition to being subjected to artificially lengthened days, a group of male and female sparrows were supplied with nest boxes and nesting materials, both sexes would reach reproductive competence and the females would lay fertile eggs. If, however, nesting boxes and nesting materials were not supplied, the females would not reach reproductive maturity and their ovaries would eventually regress without ever reaching full development.

One other external factor associated with light has been proposed as the cause for seasonal sexual periodicity in the English sparrow. Perry (1938) reported that sparrows fed on wheat irradiated by ultra-violet lamps during December, January, and February, but themselves exposed only to normal winter daylight showed marked gonadal development. Kirschbaum, Pfeiffer, *et al.* (1939) carefully duplicated Perry's work but were unable to confirm it.

III. MATERIALS AND METHODS

A. CAPTURE AND MAINTENANCE OF SPARROWS

Because trapping produced such meagre results, the sparrows used in the experiments about to be reported were captured at night with a long-handled net as they roosted in the ivy on the sides of buildings.

The cages in which the birds were kept measured 3 feet long, 2 feet wide, and 2 feet deep, and were made of ½ inch galvanized wire mesh. A supporting framework was omitted in order that no part of the cage be shaded. Each cage was equipped with a single perch running lengthwise. Grit, cuttlebone, water, and food, which consisted of millet and "Pablum" with the frequent addition of sliced apple or lettuce, were available at all times. Males and females were caged together. The number of birds per cage never exceeded twelve. It was not necessary to clean the cages since the droppings fell through the bottom of the cage to the floor.

B. SOURCE OF ARTIFICIAL LIGHT

The importance of wave-length in the photoperiodic response of birds has been clearly established (see Benoit and Ott, 1944, and Ringoen, 1942). The sources of artificial white light hitherto used in

the experimental study of photoperiodism have been either incandescent tungsten lamps or in a few instances ultraviolet sunlamps, both of which have a spectrum which differs markedly from that of sunlight. This might invalidate a comparison of the laboratory results with natural conditions.

In the experiments reported here, all light was supplied by "Daylight Fluorescent Lamps" manufactured under patents of the General Electric Company. See Fig. 1 for a comparison of sunlight with the light from both tungsten and "Daylight Fluorescent" lamps. It will be noted that the fluorescent lamps approximate sunlight remarkably. Another asset of fluorescent lamps is that the large area of their radiating surfaces makes it possible to obtain a more uniform light in a cage than would be the case with any other convenient source of light. A final and important advantage is that fluorescent lamps have such a low operating temperature that their heating effect can be ignored.

C. MEASUREMENT OF LIGHT

The light used in the present experiments was measured for the most part by a Weston Illumination Meter which was calibrated in foot-candles. Although the instrument is standardized on tungsten filament light at one color temperature, no correction is required for illumination having the same color composition as sunlight.

Since the lowest intensities of light used in the experiments were below the range of the Weston Illumination Meter, these intensities were measured with a MacBeth Illuminometer. The two instruments were checked against each other at intensities ranging from 0.2 to 5.0 foot-candles and they showed good agreement.

In order to find the actual range of intensities, as well as the mean intensity of light, to which the experimental birds were exposed, in every cage 12 measurements were made at the bottom, 12 at the top, 12 at each of two intermediate horizontal planes, and 3 on the perch. At each station the photronic cell was rotated or tilted to give the maximum reading. To avoid diminution of the intensity of the light with time, the intensity was measured weekly and lamps replaced when necessary.

It was found that the birds spent a little more than 60% of the time on the perch, about 35% of the time on the floor and the rest of the time either clinging to the sides of the cage or flying about. Therefore, the average intensity of light to which the birds were exposed was assumed to be the weighted mean of the values measured on the floor of the cage and on the perch. This is the light intensity used for comparison and discussion.

D. METHOD OF ANALYSIS OF EXPERIMENTAL RESULTS

Gonadal activity in the English sparrow, as in other vertebrates is under control of hormones secreted by the pituitary, Witschi and Keck (1935) and Riley and Witschi (1938). Consequently, in a study of the factors controlling the cyclical nature of reproduction in the English sparrow, the pituitary is the primary target of the investigator. As indicators of secretory activity by the pituitary both primary and secondary sex characters may be used.

1. *Males.* Three indicators of reproductive activity were used: spermatogenic condition, testicular weight, and bill pigmentation.

Spermatogenic condition is the most critical and reliable of the indices since it entails direct microscopic examination of the germ cells themselves. Therefore, in this study primary dependence was placed on this criterion. At the end of the period of exposure to light, the birds were killed, their gonads removed and immediately fixed in Bouin's solution. After preparation by the paraffin method, at least one testis from every bird was sectioned at 10 micra, stained with Delafield's haematoxylon, and examined microscopically, Depending on the degree of spermatogenic advancement, the testes were placed in one of the 6 classes listed below:

I. resting spermatogonia only
II. spermatogonia dividing, but only a few spermatocytes present
III. many spermatocytes
IV. spermatocytes with spermatids
V. spermatids with a few sperm
VI. full spermatogenic activity with many sperm

The typical histological picture presented by each class is shown in Figs. 2 to 7.

Weight was selected as an easily and accurately measurable indication of growth. Each testis was weighed to the nearest tenth of a milligram after being fixed in Bouin's solution. The weight of each experimental testis was divided by the mean weight of the control testes and the ratio thus obtained, used for comparison. Since the left testis was almost always larger than the right, right testes were compared with right testes and left with left, although the mean weight of both testes could be used just as well.

The bill of the male English sparrow darkens under the influence of testosterone, Keck (1932, 1933), Witschi and Keck (1935), Witschi

(1936), Witschi and Woods (1936). Five classes of bill pigmentation were set up. Although arbitrary, they indicate a regular and easily recognizable series and reproduce the sequence of changes through which the bill passes as the male progresses toward full testicular activity. They are as follows: yellow and horn-color, horn-color and gray, gray, gray and black, and all black. The class of pigmentation was recorded at the beginning and end of each experiment for every male. The number of advances in class during the experiment was used as an expression of the hormonal production of the testis. Aside from being corroborating evidence in the analysis of the reproductive response of the male, bill pigmentation is very useful to the experimenter because it is an easily visible indication of the gonadal development during the experiment.

2. *Females.* The ovary and oviduct were weighed to the nearest tenth of a milligram. The weights of these organs from the experimental animals were divided by the mean weights of those of the controls and the resulting figure used for purposes of analysis. The oviducts grow markedly in the presence of estrogen (Keck, 1932, 1934). Consequently their weights are an indication of the production of this hormone by the ovaries.

IV. THE ROLE OF LIGHT INTENSITY

A. REVIEW

Despite the fact that intensity is one of the most conspicuous variables of sunlight, relatively little critical work has been done on its role in the photoperiodic response of vertebrates and that which has been done cannot easily be related to natural conditions in a quantitative manner.

From the ecological point of view, the primary questions to be answered concerning the role of light intensity in photoperiodism are these:

1. Can light intensity modify the photoperiodic response?
2. If so, what is the minimum intensity that will evoke the reaction?
3. What is the intensity beyond which further increases have no effect?
4. Can light intensity be substituted for day length?

5. Is the range of effective intensities such that the response of an animal to day length in nature can be modified by the variation in the intensity of sunlight from day to day and season to season?

The present knowledge concerning these problems will be considered in relation to the questions listed above. Light intensity does modify the photoperiodic response of passerine birds. Bissonnette (1931b) established the fact that the photoperiodic response of starlings increased with increasing intensity, but his experiments yielded little satisfactory quantitative data, because he did not measure the light within the cages and he used light of controlled intensity only after sundown, sunlight being used during the day. Bissonnette and Wadlund (1933) reported that for the starling a 200 watt incandescent lamp was more effective than a 1000 watt incandescent lamp, but they also suggested that differences in wave-lengths of light emitted by the two lamps may have been a factor.

Burger (1939b) found that male starlings kept on a uniform day length of 10½ hours showed no spermatogenic development when the intensity of the artificial light to which they were exposed was increased by small daily increments from 5 foot-candles to 190 foot-candles. From this it was concluded that an increase in light intensity during short days did not have the same effect as an increase in the length of the short days, i.e., during short days, intensity of light at least above 5 foot-candles cannot be substituted for duration of exposure to light.

Brown and Rollo (1940) found that intensity was a factor in determining the type of feather regenerated in a plucked area on an African weaver-finch, *Pyromelana*. Light of controlled intensity was added for 2½ hours after 11½ hours of daylight. Thirty foot-candles allowed the regeneration of the non-breeding plumage normal for the season, while 250 foot-candles caused regeneration of nuptial plumage. This work was expanded and extended by Rollo and Domm (1943) who tested the effects of light supplied by incandescent lamps of various wattages and ranging in intensity from 3⅔ to 216 foot-candles. They found an intensity of maximal effectiveness. Light with an intensity of 126 foot-candles caused an earlier onset of moult and subsequent growth of nuptial plumage than light of either lower or higher intensity. In this species the growth of nuptial plumage is under direct pituitary control since feathers as well as gonads respond to gonadotropic hormones.

Although it seems probable that the mode of action of light is different in birds and mammals, Marshall and Bowden (1934) showed that the speed of induction of estrus by artificially lengthened days increased directly with increasing light intensity.

The answers to the questions concerning the ecological significance of light intensity in the photoperiodic responses of animals which were posed in the preceding review remain for the most part unknown. For no animal have all of the questions been answered and for the English sparrow none of them have been answered.

B. PLAN OF EXPERIMENTS

The set of experiments about to be described was designed to obtain a quantitative expression of the relationship between light intensity and degree of gonadal development in sparrows, and in addition to establish the minimum intensity which would evoke the response and also the intensity above which further increases no longer had an accelerating effect. Further, by running experiments at the same intensities and day lengths for different periods of time, it was hoped to determine the relationship between intensity of light and number of days of exposure.

The experiments were run in two dark rooms, windowless, black-walled, and equipped with forced ventilation. The fluorescent lights and some of the cages were suspended from the ceiling. Cages A, B, C, and D were arranged as shown in Fig. 8. Cage E, whose light source was a single 15 watt fluorescent lamp masked as shown in Fig. 9, was placed by itself in one of the dark rooms. The cage for the controls, which was lighted by a single 30 watt fluorescent lamp, was placed in the compartment to the left of the curtain shown in Fig. 8. All lights were turned on and off by automatic timers.

C. THE EFFECT OF LIGHT INTENSITY DURING 16-HOUR DAYS ON TESTICULAR DEVELOPMENT

In the first experiment, male English sparrows were exposed during the winter to light of five different intensities 16 hours per day for 25 days and then killed for examination (see Table 2 for dates). The birds were not grouped according to age, because Riley (1936) reported that by late fall, males of all age groups in this species react

TABLE 1

SUMMARY OF LIGHT INTENSITY IN CAGES

Cage	A	B	C	D	E	Control
Maximum Intensity	464	83.0	14.0	1.2	0.07	28.0 foot-candles
Minimum Intensity	124	30.0	7.0	0.4	0.03	5.8
Intensity at Center of Cage	200	55.0	10.2	0.8	0.05	11.1
Mean Intensity on Perch	296	62.5	11.2	0.8	0.05	14.7
Mean Intensity on Floor of Cage	139	32.5	8.3	0.4	0.03	5.9
Weighted Mean of Perch & Floor of Cage	244	52.4	10.3	0.7	0.04	11.8

TABLE 2

SUMMARY OF EXPERIMENTS ON THE EFFECT OF LIGHT INTENSITY ON TESTICULAR DEVELOPMENT DURING 16-HOUR DAYS

	Experiment					
	1A	1B	2A	2B	3	4
Experiment started	1-14-46	2-24-46	1-14-46	2-24-46	2-10-46	10-19-47
Days of exposure to light	25	25	46	46	11	25
Males in cage A	6	0	0	0	4	5
Males in cage B	6	0	0	0	0	0
Males in cage C	3	0	4	0	0	5
Males in cage D	3	0	3	0	0	0
Males in cage E	0	3	0	3	0	0
Controls	3	2	3	3	4	5

similarly to added hours of light. Since the lowest light intensity (0.07 foot-candles) used in the first part of this experiment evoked an appreciable response, a much lower intensity (0.04 foot-candles) was used in the second part. Separate controls were used for both sections of the experiment. In this and all other experiments carried out in this

investigation, the controls were exposed for 8 hours daily to light with an intensity of approximately 10 foot-candles.

The spermatogenic condition of the birds at the end of the two parts of the first experiment is shown in Tables 3 and 4. The comparison of the number of advances in spermatogenic class beyond the most developed of the controls caused by each of the five intensities of light which is shown by Table 5 allows the results of both halves of the experiment to be compared. It will be observed that (1) a light intensity of 0.04 foot-candles was insufficient to cause any spermatogenic progression, (2) the greatest variation in the effect of light intensity

TABLE 3

SPERMATOGENIC CONDITION AFTER 25, 16-HOUR DAYS (EXP. 1A)

Spermatogenic class	Controls	Light Intensity in Foot-Candles			
		0.7	10.3	52.4	244.0
VI. Full spermatogenic activity with many sperm			xx	xxxx	xxxxx
V. Spermatids plus few sperm			x	xx	x
IV. Spermatocytes plus spermatids		xx			
III. Many spermatocytes		x			
II. Spermatogonia dividing, but few spermatocytes	x				
I. Resting spermatogonia	xx				

occurred below 10 foot-candles, and (3) above 10 foot-candles further increases of light intensity caused no further spermatogenic acceleration.

The increases in testicular weight showed the same relation to light intensity as did spermatogenic development. The maximum gradient in the response (Fig. 10) occurred below 10 foot-candles and the difference between the effects caused by light intensities greater than this value was relatively slight. Indeed, the mean weight of the testes of the birds exposed to 10 foot-candles was actually larger than that of the birds exposed to either of the two higher intensities. The testes

TABLE 4
SPERMATOGENIC CONDITION AFTER 25, 16-HOUR DAYS (EXP. 1B)

Spermatogenic class	Controls	Light Intensity
		0.04 f.c.
IV		
III	x	x
II	x	xx
I		

TABLE 5
SPERMATOGENIC ADVANCEMENT DURING 25, 16-HOUR DAYS

Advances in sperm class beyond controls	Light Intensity in Foot-Candles				
	0.04	0.7	10.3	52.4	244.0
4			xx	xxxx	xxxxx
3			x	xx	x
2		xx			
1		x			
0	xxx				

TABLE 6
RELATION BETWEEN LIGHT INTENSITY AND BILL PIGMENTATION AFTER 25, 16-HOUR DAYS

Advances in class of bill pigmentation	Controls	Light Intensity in Foot-Candles				
		0.04	0.7	10.3	52.4	244.0
4				xx	xxx	xxxxx
3			x	x	xx	x
2					x	
1			xx			
0	xxxxx	xxx				

of the birds exposed to the lowest intensity (0.04 foot-candles) were not significantly larger than those of the controls.

The response of bill pigmentation (Table 6), which is an indicator of male sex hormone production, agrees with the results obtained by the other methods of analysis.

The second experiment was similar to the first except that it was run for 46 rather than 25 days. Since the gonads of the birds exposed to the two highest light intensities used in the first experiment were already well developed after 25 days, it was thought that a longer exposure to these intensities would yield little of further interest.

TABLE 7

SPERMATOGENIC CONDITION AFTER 46, 16-HOUR DAYS

Spermatogenic class	Experiment 2A			Experiment 2B	
	Controls	Light Intensity in f.c.		Controls	Light Intensity in f.c.
		0.7	10.3		0.04
VI		xx	xxxx		
V		x			
IV					x
III				xx	x
II	xx				x
I	x			x	

Therefore, only the 3 lower intensities, 0.04, 0.7, and 10.3 foot-candles, were used. As indicated in Table 2, the test was run in two parts.

The spermatogenic condition of the birds at the end of the experiment is summarized in Tables 7 and 8. All four of the birds exposed to light of 10 foot-candles showed full spermatogenic activity with many sperm. All of the birds in the 0.7 foot-candle cage had progressed far beyond the condition of those individuals from the same cage which had been examined after 25 days, and two of them were as well developed as the birds exposed to any of the higher intensities. However, only one of the three birds exposed to light of 0.04 foot-candles had advanced beyond the state reached by the most developed bird

from the same cage at 25 days. This individual, the only one which had progressed farther than the most advanced of the controls, had just begun to form a few spermatids.

TABLE 8

SPERMATOGENIC ADVANCEMENT DURING 46, 16-HOUR DAYS

Advances in Sperm Class Beyond Controls	Light Intensity in Foot-Candles		
	0.04	0.7	10.3
4		xx	xxxx
3		x	
2			
1	x		
0	x		
—1	x		

TABLE 9

RELATION BETWEEN LIGHT INTENSITY AND BILL PIGMENTATION AFTER 46, 16-HOUR DAYS

Advances in Class of Bill Pigmentation	Controls	Light Intensity in Foot-Candles		
		0.04	0.7	10.3
4			x	xxx
3			x	x
2			x	
1		xx		
0	xxxxx	x		

The effect on testicular weight of 46 days of exposure to the three intensities of light is shown in Fig. 10. The weight of the testes increased with increasing intensity. At each intensity the mean weights the of testes was greater after 46 days than after 25 days. Even after

46 days, however, the mean weight of the testes of those birds exposed to 0.04 foot-candles was only 4.4 times as large as that of the controls. This is only about 1/10 the growth caused by light intensities of 0.7 and 10.3 foot-candles in the same length of time.

Light intensity was correlated with degree of bill pigmentation after 46 days of exposure just as it was after 25 days of exposure. As Table 9 indicates, the more intense the light, the greater the increase in pigmentation. Only two of the three birds exposed to the light of 0.04 foot-candles gave evidence of the production of testosterone by the darkening of their beaks.

A third experiment, which was similar in plan to the first two, was designed to obtain evidence concerning the effect of different light intensities when administered for a small number of days. Four males were placed in each of the two cages of highest light intensity. At the end of the eleventh 16-hour day of exposure, all eight were killed for examination. It was assumed that during the 11 days of the experiment there would be no change in the reproductive condition of the controls. Therefore, since the third experiment began within a few days of the end of the first experiment, the controls of the latter were used as a basis of comparison for the results of the former (see Table 2 for dates).

Both groups of birds showed spermatogenic progression at the end of the experiment. All of the birds exposed to light of 244 foot-candles had many spermatocytes present, but none had produced any spermatids. Three of the four birds exposed to light of 52 foot-candles showed spermatocytes, but one of them, slightly more advanced than the others, had begun to form a few spermatids.

The weights of the testes (Fig. 10) indicate a slightly greater growth of the gonads in the birds exposed to the less intense light. The difference between the two is so slight, however, when compared with the spread, that it is of no significance.

The experiment was of such short duration that changes in bill pigmentation, although faintly perceptible, were not great enough to be reliably measured.

From the preceding, it is apparent that during an 11-day exposure, just as during a 25-day exposure, a light intensity of 244 foot-candles when administered in the winter during a day length of 16 hours, causes no more gonadal growth than does an intensity of 52 foot-candles.

Since Kirschbaum and Ringoen (1936) and Riley (1936) reported that male English sparrows responded more strongly to increased day

length in winter than in fall, it was thought advisable to test for seasonal variation in their response to light intensity. Ten immature male sparrows were exposed to light of approximately 10 foot-candles 8 hours per day starting Oct. 12, 1946.[1] On Oct. 19 they were divided into two groups; 5 birds were placed in cage A and 5 in cage C (see Fig. 8) and exposed to light of 244 foot-candles and 10 foot-candles intensity respectively 16 hours per day for 25 days. The five control birds were as usual exposed for 8 hours daily to light with an intensity of approximately 10 foot-candles.

TABLE 10

SPERMATOGENIC CONDITION AFTER 25, 16-HOUR DAYS (EXP. 4)

Spermatogenic Class	Controls	Light Intensity in Foot-Candles	
		10.3	244.0
VI			xxx
V			xx
IV		x	
III			
II		xxx	
I	xxxxx		

In the fall 16 hours per day of light with an intensity of 10 foot-candles caused relatively little spermatogenic progression when compared with a similar exposure to light with an intensity of 244 foot-candles. After 25 days the most advanced bird in the 10 foot-candle group was less advanced than the least developed of the 244 foot-candle group (Table 10).

The analysis of the weights of the testes of the two groups of birds (see Fig. 11) showed the same situation as did the histological examination. Once again there was no overlap between the birds exposed to the two intensities. The mean size of the testes of the birds exposed to the higher intensity was more than 4 times as great as that of the

[1] The age of the birds was determined with the technique described by Miller (1946). An incision was made in the scalp of the bird and the exposed skull examined to determine the degree of ossification which in turn allowed the separation of first year, from older birds.

birds exposed to the lower intensity. Bill pigmentation (Table 11) corroborates the other lines of evidence.

The conspicuous difference between the effects of light intensities of 10 and 244 foot-candles during the fall contrasts sharply with the situation existing during the winter when, as previously described, these two intensities are equally effective. The significance of this seasonal variation in response will be discussed later.

TABLE 11

RELATION BETWEEN LIGHT INTENSITY AND BILL-PIGMENTATION AFTER 25, 16-HOUR DAYS (EXP. 4)

Advances in Class of Bill Pigmentation	Controls	Light Intensity in Foot-Candles	
		10.3	244.0
4			x
3			xx
2		xx	x
1		xx	x
0	xxxxx	x	

D. THE EFFECT OF LIGHT INTENSITY DURING 16-HOUR DAYS ON OVARIAN DEVELOPMENT

This experiment, designed to test the reproductive response of the female sparrow to light of various intensities, was similar to the first of the experiments on males, except that, since females have a less pronounced photoperiodic response than males, it extended over a greater number of days. The females were exposed for 46 days, 16 hours per day, to light of the 5 intensities shown in Table 1. The test using the lowest intensity of light was run later in the winter than the others (Table 12). At all times during this experiment, males were in the cages with the females. The controls were treated in the same way as the controls for the intensity experiments on males.

Production of gonadotropic hormones, as indicated directly by the growth of the ovaries and indirectly by the growth of the oviducts,

was differentially influenced by different light intensities. As shown in Figs. 12 and 13 the growth of both ovaries and oviducts progressed with increasing intensity, but in no instance was full breeding condition reached. A photograph of the most developed reproductive system obtained is shown in Fig. 14.

Although both females and males react in a qualitatively similar manner to light intensity, quantitatively there is a conspicuous difference. During the winter the gonads of males exposed to light intensities of 10, 52, and 244 foot-candles showed similar degrees of development while the gonads of the females which were exposed to the same three intensities at the same time of year showed differing degrees of development. The range of differential response of the ovaries to light intensity extended throughout the entire range of intensities tested.

TABLE 12

SUMMARY OF EXPERIMENTS ON THE EFFECT OF LIGHT INTENSITY ON OVARIAN DEVELOPMENT DURING 16-HOUR DAYS

	Experiment		
	1A	1B	2
Experiment started	1-14-46	2-24-46	1-14-46
Days of exposure to light	46	46	86
Females in cage A	3	0	3
Females in cage B	4	0	3
Females in cage C	3	0	3
Females in cage D	3	0	3
Females in cage E	0	4	0
Controls	3	3	3

As described in the preceding section, at all of the intensities tested, the gonadal development of male sparrows was greater after 46 days of exposure to light than after 25 days. In order to determine whether or not a comparable increase in days of exposure caused a similar gonadal development in the female, females were exposed to the various intensities of light 16 hours per day for 86 days and then killed for

examination. No females were exposed to the light with an intensity of 0.04 foot-candles, and during the last 30 of the 86 days no males were present in the cages.

After this exposure of over 12 weeks the size of the ovaries was no longer correlated with light intensity (Figs. 12 and 13), the birds exposed to the various intensities having reproductive organs of about the same size. At all light intensities both ovaries and oviducts were smaller after 86 days than they had been after 46 days. This fact corroborates the results of Polikarpova (1940) who found a similar regression after a prolonged exposure to light.

There arises the question of whether or not the females in the present experiments reached full breeding condition at any time between 46 and 86 days. It can almost certainly be stated that they did not. Complete ovarian activity has never been produced in this species by light despite exposures to artifically lengthened days for periods intermediate to those used in the present experiments (Riley and Witschi, 1938; Ringoen and Kirschbaum, 1939).

Thus, in attempting to analyse the role of light as an environmental control of the breeding cycle in the English sparrow, the male should be the principle target of the investigator, for light alone will bring the male into full breeding condition while it will cause only partial gonadal development in the female.

E. THE EFFECT OF LIGHT INTENSITY DURING 10-HOUR DAYS ON TESTICULAR DEVELOPMENT

As will be discussed in a subsequent section of this paper, a day length of 10 hours during November and December evoked no increase in size of the testes and only a very slight spermatogenic advancement. Since 10 hours thus appeared to be close to the shortest length of day which would cause gonadal progression, it was decided to test the effect of light of different intensities at this day length.

Fourteen male sparrows, which for the preceding two weeks had been in a dark room exposed to light with an intensity of approximately 10 foot-candles for 8 hours daily, were divided into two groups. Seven of the birds were placed in a wire mesh cage which was suspended immediately below the battery of fluorescent lamps shown in Fig. 8. This cage was 3 feet long and 2 feet wide, but only 1 foot deep. The purpose of the shallowness was to keep all parts of the cage as close to the source of light as possible and by so doing insure a high intensity of light. The seven remaining birds were placed in a cage of the usual

dimensions (3′ x 2′ x 2′) in another dark room and exposed to light of much lower intensity (see Table 13). Both groups of birds were put on day lengths of 10 hours for 25 days starting December 28, 1946 and then killed for examination. The 3 controls were exposed as usual to light of approximately 10 foot-candles for 8 hours per day.

TABLE 13

SUMMARY OF LIGHT INTENSITY IN CAGES

	High intensity cage	Low intensity cage
Maximum intensity	345 foot-candles	75
Minimum intensity	155	9
Intensity at center of cage	280	26
Mean intensity on perch	332	33
Mean intensity on floor of cage	172	10
Weighted mean of intensities on perch and floor	270	25

TABLE 14

SPERMATOGENIC CONDITION AFTER 25, 10-HOUR DAYS

Spermatogenic Class	Controls	Light Intensity	
		25.0 f.c.	270.0
IV			
III		xx	xx
II	x	xxxx	xxxx
I	xx	x	x

Both of the light intensities used in this experiment produced spermatogenic activity and the development (Table 14) caused by 25 foot-candles was as great as that caused by 270 foot-candles.

The mean weight of the testes of each group of experimental birds was over twice that of the controls (Fig. 11). Although the mean gonadal weight of the birds exposed to the lower intensity was slightly

greater than that of the birds exposed to the higher intensity, the difference is not statistically significant.

There was no appreciable difference in degree of bill pigmentation between the two groups of experimental birds.

From these observations it is concluded that a day length of 10 hours is sufficient to cause spermatogenic advancement and growth of the testes of the English sparrow during January and that at this day length and season there is no difference in effect between 25 and 270 foot-candles after an exposure of 25 days.

From the experiments reported above, it is apparent that under laboratory conditions, light intensity can modify the photoperiodic response of both male and female sparrows. The physiological and ecological significance of this fact will be discussed in detail after the effect of the primary factor in photoperiodism, i.e., the day length, has been considered.

VI. THE ROLE OF DAY LENGTH

A. REVIEW

Although photoperiodism was originally defined as a response to the relative lengths of day and night, experiments designed to compare the effects of different photoperiodically effective day lengths, and not merely to demonstrate that very long or very short days evoke photoperiodic responses, have been made on only two species of birds, *Pyromelana franciscana*, a weaver finch from tropical Africa, and *Sturnus vulgaris*, the European starling.

If one accepts the definition of day length for photoperiodism as the daily period during which sunlight of effective intensity and spectral distribution is available, the question of whether it is the absolute day length, or the change in day length which is important immediately arises. The answer for at least one species, the starling, has been supplied by Burger (1939a, 1940) who found that if male starlings had their daily period of light reduced to 6 hours, a subsequent 3 hour increase caused no testicular activation. A 3 hour increase resulting in a day length of 12½ hours, which is approximately 3 hours longer than the shortest day of the year in Connecticut where the experiments were performed, caused, however, marked sexual advancement.

Burger also found that reduction in day length will not of itself cause gonadal regression. On November 21, he subjected sexually

inactive male starlings to lengthened days by adding artificial light for 11 hours after dark. Half of the birds were kept on these long days until December 18, the end of the experiment; half had their artifically extended days shortened 30 minutes about every third day, thus decreasing the length of the daily exposure to light approximately 4 hours during the course of the experiment. Despite this reduction in day length, there was no difference in the gonadal condition of the two groups of birds; all showed full spermatogenic activity. Bissonnette (1931b) found, however, that a reduction of only two hours from a 12-, to a 10-hour day would cause regression of the testes in the starling. Thus it is apparent that in the male starling at least, increases and decreases in day length do not in themselves control sexual periodicity. They are effective only when the change shifts the day length into a period of light whose absolute length is such that it evokes or suppresses testicular activity.

Burger (1940) reported that the minimum length of day necessary to cause complete spermatogenesis in the starling was probably a little less than 12½ hours. In determining this figure, however, he ran his experiment for only 33 days. It seems possible that a longer experiment might have caused the production of sperm during a day length even shorter than 12½ hours. The same author reports (1939a) that 10½ hours of light daily produces just the beginning of spermatogonial mitoses, but nothing more. The earliest observation of mature sperm in wild starlings (Burger, 1940) coincides with a day length of 12.3 hours and the maximum sprematogenesis occurs when the days are 13.5 hours long (both figures apply to Hartford, Connecticut). It should be noted that if mature sperm are being produced when the day is 12.3 hours long, most of the development of the testes must of necessity have occurred earlier in the year when the days were shorter. Increases beyond 13.5 hours of daily light do not cause as great a proportional increase in testicular activity as do similar increases in day lengths lying between 10 and 13 hours.

Rollo and Domm (1943), working on a tropical weaver finch, *Pyromelana*, reported a phenomenon that has not been described in other seasonally breeding birds. They found that the optimum daily period of light was 13 to 14 hours, but that longer as well as shorter days retarded the production of nuptial plumage.[1] The inhibiting effect of very long days may be related to the fact that *Pyromelana* lives in the tropics where days longer than 14 hours do not occur.

[1] The photoperiodic response in this case was measured in terms of feather growth rather than gonadal growth, but in weaver finches the growth of nuptial plumage like that of the gonads is under the influence of gonadotropic hormones.

Although in some passerine birds it seems well established that it is not the change in day length, but the absolute day length which is the critical factor, the fact remains that in nature the period of light changes only by a few minutes per day. Rowan (1938:386) says that, " . . . in juncos complete normality depends on slight, progressive advances in the length of illumination, longer jumps affecting the birds adversely and resulting in complete irregularity." Bissonnette (1936: 377) states, however, "With starlings a maximum effect and consistent results were obtained by giving large and immediate increases in daily periods of light with electric light, rather than by gradually increasing periods, even in autumn when daily periods of daylight decrease."

TABLE 15

SPERMATOGENIC CONDITION AFTER 18 DAYS

Spermatogenic Class	Controls	Hours of Light per Day				
		10	12	14	16	24
VI						
V				x	xx	x
IV			x	xx	xx	xxx
III			xxx	xx	xx	x
II		xx	x			
I	xxxx	xxx				

B. THE EFFECTS OF DIFFERENT DAY LENGTHS ON GONADAL DEVELOPMENT

The experiment about to be described was designed to obtain a quantitative evaluation of the relationship between day length and degree of gonadal development in English sparrows. Twenty-six female and 26 male sparrows were placed in a dark room on November 12, 1946 and exposed to light of approximately 10 foot-candles for 8 hours daily. On November 19, these birds were divided into 5 groups, each containing 5 or 6 males and 5 or 6 females. Each group was placed in a separate cage and illuminated by a single 40 watt "Daylight" fluorescent lamp which was suspended overhead at such a distance that the weighted mean of the light intensities on the perch and on the floor of the cage, measured as previously described, was

between 25 and 27 foot-candles. The cages were placed in separate dark rooms and lighted for 10, 12, 14, 16, and 24 hours per day respectively. The controls, 4 males and 4 females, as usual, were exposed 8 hours per day to light with an intensity of approximately 10 foot-candles. The males were killed for examination after 18 days and the females, after 30 days.

As shown by Fig. 15 testicular size increased directly with day length. The maximum increase in effectiveness came between day lengths of 12 and 14 hours, the 8-hour increase from 16 to 24 hours of light per day having only ¼ the effect of the 2-hour increase from 12 to 14 hours.

From Table 15, which summarizes the spermatogenic condition of the birds at the end of the experiment, it will be noted that the gonads of two of the five birds exposed to 10-hour days contained a few spermatocytes. Therefore, even a day as short as 10-hours is long enough to cause limited spermatogenic advancement in the English sparrow during the fall. The increase in day length from 12 to 14 hours caused the largest change in spermatogenic condition. Although only one of the 12-hour birds showed anything more advanced than spermatocytes, some of the 14-hour birds had mature sperm. There was little difference in the spermatogenic condition of the birds exposed to day lengths of 14, 16, and 24 hours.

Neither 10- nor 12-hour days caused the production of sufficient testosterone to produce a noticeable darkening of the bill (Table 16). There did, however, appear to be somewhat greater production of sex hormones at day lengths of 16 to 24 hours than at 14 hours.

At the end of the experiments using different day lengths, two male sparrows which had not been used in any experiments were still available. Both birds had been captured during the first week in December and had been kept on a day length of 8 hours with a light intensity of approximately 10 foot-candles from the time of their capture. As previously discussed, a day length of 10 hours is sufficient to cause some testicular growth in a period of 25 days. Therefore, it was thought desirable to determine the effect of 10-hour days over a longer period.

The two males were placed in one of the cages previously used in the 10-hour intensity experiment and exposed to light with an intensity of 270 foot-candles (see Table 13) for 46 days starting January 23, 1947. No controls were used because no males captured before the winter solstice were available. At the end of the experiment both birds showed very marked gonadal advancement. One, in full breeding

condition, had testes as fully developed as those obtained in any of the experiments reported in this paper and the other, although less developed, had begun to form spermatids.

Despite the absence of controls and the small number of birds involved, this experiment shows that it is at least possible for the male sparrow to reach full breeding condition on a day length of 10 hours. The ecological significance of this fact will be discussed later.

TABLE 16

CORRELATION BETWEEN DAY LENGTH AND BILL PIGMENTATION AFTER 18 DAYS

Changes in Class of Bill Pigmentation	Controls	Hours of Light per Day				
		10	12	14	16	24
4						x
3					x	xx
2				xx	xxx	xx
1				xxx	x	
0	xxxx	xxxxx	xxxxx		x	

As can be seen from Figs. 16 and 17 the day lengths which evoked the greatest change in rate of ovarian growth were longer than those which had a similar effect on the testes. The ovaries of the 10-hour birds were the same size as the ovaries of the controls. The 12- and 14-hour birds showed a small amount of ovarian growth with no significant difference between the two. The 16-hour birds had ovaries twice as large as those of the controls, while the 24-hour birds had ovaries four times as large as those of the controls. The oviducts showed the same general picture except that the relative growth at all day lengths was greater. The slight increase in size of the oviducts of the birds exposed to 10-hour days may indicate that even a day length of 10 hours is sufficiently long to cause the production of some estrogen.

Kirschbaum and Ringoen (1936) found that exposure to short days during winter and spring will not completely suppress testicular activity in the English sparrow. During January, February, and March they gradually reduced the day length to which 7 male sparrows were exposed to 3 hours. When the birds were examined in April, although

none showed mature spermatozoa, the gonads of one had increased in size and the gonads of three others showed spermatogonial mitoses without increase in size. Thus in male English sparrows there is an internal rhythm which even greatly reduced day length does not completely suppress.

In the present investigation an experiment to determine whether or not short days will completely suppress seasonal gonadal growth in females was carried out. The experiment was run during two winters, 1945–46, and 1946–47. In each year the birds received the same exposure to light and were killed on the same dates. In the following discussion the results obtained in the two years are combined. Starting December 21, female sparrows were placed in a dark room and exposed for 8 hours daily to light with an intensity of approximately 10 foot-candles. Six birds were killed for examination on January 15, 8 on February 28, and 6 on April 9. There was no perceptible difference in degree of sexual development between the three groups of birds. The mean ovarian weight of the birds examined on January 15, was 12.7 mg.; on February 28, it was 13.1 mg.; and on April 9, it was 12.6 mg. There is no statistically significant difference between the three mean weights. Thus, any intrinsic rhythm of seasonal ovarian growth that may have been present was not expressed between the winter solstice and the first week of April when the birds were kept on 8-hour days.

The experiments reported above show that in both male and female English sparrows, gonadal growth increases directly with increasing day length. In the male the greatest increase in relative gonadal growth occurs between day lengths of 12 and 14 hours, there being relatively little difference between the testicular growth caused by day lengths of 14, 16, and 24 hours. A day length of 10 hours is sufficient to bring the male to full breeding condition. In the female the greatest increase in gonadal growth occurs between day lengths of 16 and 24 hours. No ovarian growth is caused by either 8-hour or 10-hour days.

DISCUSSION

A. MODE OF ACTION OF LIGHT

The fact that in the English sparrow different intensities of light evoke different degrees of gonadal development supports the theory that light itself produces the photoperiodic response. If wakefulness were the critical factor, all intensities above that necessary to keep a

bird awake should have the same effect. In each of the intensity experiments reported in this paper, although the birds were all awake for the same period daily, gonadal development increased with increasing intensity of light. Therefore, it seems inescapable that the gonadal development was controlled directly by light because light intensity was the only variable.

The differential response to light intensities which are adequate for vision and normal activity can be explained in terms of the theory put forward by Benoit and Ott (1944) which suggests that in birds, the site of the photoperiodic excitation is located within the brain median to the eyes and that the light acts by passing through the transparent material of the eye, through the thin bony wall of the skull and into the region of the pituitary and there, by photochemical stimulation either of the hypothalamus or the pituitary itself, evoking the production of gonadotropic hormones by the hypophysis. The quantity of light which could pass through the tissues of the orbit, the skull, and the brain and then stimulate an internally located receptor would increase directly with increasing intensity. Because of the relative opacity of the tissues of the head, long after light intensity has passed the visual threshold it should still evoke a differential response from a light-sensitive locus within the brain.

B. RANGE OF LIGHT INTENSITIES WHICH PRODUCE A DIFFERENTIAL RESPONSE FROM THE PITUITARY

It has been shown that in the fall, 244 foot-candles are much more effective than 10 foot-candles in evoking testicular growth, but that in the winter the two intensities are equally effective. This seasonal difference in photoperiodic response could be explained either by seasonal variation in the sensitivity of the pituitary to light, or by seasonal variation in the sensitivity of the gonads to gonadotropic hormones. Such a seasonal variation in gonadal sensitivity has been demonstrated in the female sparrow (Kirschbaum, Pfiefer et al, 1939), but not in the male. If such a situation does exist in the male, however, it follows that when the sensitivity of the testis to gonadotropic hormones is high, the range of light intensities which evoke differential testicular growth should be greater than when the sensitivity is low. Therefore, the similar growths shown by the testes of the sparrows exposed to the three highest intensities of light during the winter may well be due, not to the fact that the amount of gonadotropic hormones being produced in the pituitary by the three different intensities was

the same, but to the fact that at all three intensities the quantity of hormones produced equalled or exceeded the amount necessary to allow the gonads to grow at their maximum rate. The point, of course, cannot be settled until further evidence is available.

During the fall, however, it was definitely established that 244 foot-candles were more effective than 10 foot-candles in causing pituitary secretion of gonadotropic hormones in the male so that it can be stated definitely that at least at certain times of the year the pituitary of the male English sparrow responds differentially to light intensities higher than 10 foot-candles.

In the case of the female even during winter the differential response of the pituitary to light extended throughout the range of intensities tested (0.04, 0.7, 10, 52, and 244 foot-candles). This means that the female pituitary is affected by differences in intensity beyond the 52 foot-candle level.

From the discussion above, it would appear probable that in both sexes of the English sparrow the differential response of the pituitary to light intensity extends beyond 52 foot-candles, but that in the male in winter the hormonal output caused by 10 foot-candles is sufficient to produce maximal development, consequently higher intensities cause no further acceleration of testicular growth, while in the female the differential gonadal response is apparent even at relatively high intensities because of the relative insensitivity of the ovaries to gonadotropic hormones.

C. THE EFFECTS OF LIGHT OF VERY LOW INTENSITY

Since in avian photoperiodism the primary factor is the production of gonadotropic hormones, in considering the effects of low intensities of light, two principal points are to be determined: first, the minimum light intensity which will cause the production of a quantity of hormones sufficient to bring the animal into full breeding condition; and second, the minimum light intensity which will produce a quantity of hormones sufficient to have a measurable effect on the gonads. There is very little quantitative evidence from which to determine these two points for seasonally breeding birds.

Rollo and Domm (1943) found that, given time, any light intensity adequate for survival will cause the growth of nuptial plumage in the male African weaver finch, *Pyromelana*. From their work, however, the range of light intensity adequate for survival seems remarkably restricted when compared with the range of intensity of sunlight. They reported that an intensity of $3\frac{2}{3}$ foot-candles caused convulsions

and death because it was too low, and that an intensity of only 216 foot-candles had a similar effect because it was too high. No ill effects were observed between 7½ and 126 foot-candles.

Bissonnette's (1931a) experiments on the role of exercise in the photoperiodic response of the starling yielded some incidental data on the effects of light of low intensity. He found that a 3-candle-power incandescent lamp at a distance of 6 to 8 feet (producing within the cage an intensity calculated by Burger (1939a) to be not more than 0.5 foot-candles) caused no gonadal development in male starlings. In this instance, however, the light of controlled intensity was applied only after sunset, sunlight being used during the day, and during the period of added light the birds were forced by mechanical means to exercise. These facts make the significance of the observation uncertain. In 1932, Bissonnette reported the production of sperm in the starling when day length was extended by the use of artificial light with an intensity of 2.8 foot-candles — once again, however, the artificial light was applied only after dark.

In the experiments reported in this paper, it was found that in 46 sixteen-hour days a light intensity of 0.7 foot-candles was sufficient to cause the English sparrow to attain full spermatogenic activity. This intensity is lower than that which caused a similar response from either of the two species discussed above and is the lowest which has been reported to evoke the production of mature sperm in any seasonally breeding bird. From the marked gonadal development called forth by 0.7 foot-candles, it seems possible that light of still lower intensity might bring the male to full breeding condition.

It was also found that during the winter, 25 days of exposure to light of 0.04 foot-candles for 16 hours per day had no effect on the testes of English sparrows. The same intensity and day length for a period of 46 days, however, brought the most advanced of 3 males to the beginning of spermatid formation, although the other two were no more developed than the most advanced of the controls. The 46-day exposure also caused darkening of the bill in 2 of the 3 males. Similarly during the winter, a 46-day exposure of 4 females to light of 0.04 foot-candles 16 hours per day caused the mean weight of their ovaries to increase approximately 40 per cent beyond that of the controls.

These limited responses make it apparent that although 16 hours per day of light with an intensity of 0.04 foot-candles will cause the production of a small quantity of gonadotropic hormones by the pituitary, this production is insufficient to produce full breeding condition.

D. THE EFFECT OF VARIATION OF LIGHT INTENSITY IN NATURE

One purpose of the experiments reported in this paper was to determine the effect on the English sparrow's photoperiodic response of the normal variation of light intensity in nature. In the following discussion, only males will be considered, because they, unlike the females, can be brought to full breeding condition by light alone. Evidence presented earlier in this paper indicates that for female English sparrows, behavioral factors are as important as light in the timing of reproductive activity. Since at the present time the relative importance of light when compared with the other factors which may effect the time of onset of ovarian activity is not known, a discussion of the modification of the effect of day length by light intensity would be of little significance in the case of the female.

In this discussion there are three main factors to be considered: (1) the range of light intensities which causes a differential photoperiodic response, (2) the range of light intensities which occurs under natural conditions, and (3) the ways in which an animal's habits and habitat may affect its exposure to sunlight.

As reported above, during the winter under laboratory conditions artificial light of approximately the same spectral constitution as sunlight with an intensity of 10 foot-candles produces maximal testicular development, but an intensity of 0.7 foot-candles is sufficient to evoke the production of sperm. Therefore, it may be stated first, that as long as the intensity of sunlight does not fall below 10 foot-candles, its variation has no effect on the photoperiodic response of the male sparrow, and second, that even when the intensity of sunlight falls as low as 0.7 foot-candles, the photoperiodic response is still being evoked, but at a reduced rate.

It should be noted that the light intensities which are mentioned in the preceding paragraph are not measurements of the amount of light entering the eye of the sparrow, but rather they are measurements of the amount of light impinging on the flat surface of the photometer. Nevertheless, these intensities are proportional to the light which enters the eye of the sparrow and are a valid representation of the quantity of light falling in the area in which the sparrow is active.

When one attempts to determine the variation of light intensity under natural conditions, many difficulties of course present themselves, for the range of intensity of sunlight is tremendous (Atkins and Poole, 1936). Not only does it change seasonally, daily, and hourly, but it varies greatly from place to place within an animal's environment.

Through the kindness of Mr. Earnest Hand, Director of the Bureau of Solar Radiation of the United States Weather Service, the original pyrheliometer records for the vicinity of Boston were made available. From these records it was found that during the middle of the day, the intensity of sunlight in an unshaded area did not fall below 10 foot-candles. In order to supplement the pyrheliometer records with measurements more readily comparable to those made in the laboratory during the experiments reported in this paper, numerous readings were made with the Weston Illumination Meter whose characteristics have previously been described. All measurements were made with the photronic cell held horizontally at ground level in places where sparrows were frequently observed.

The lowest intensity measured, except near sunrise and sunset, was recorded at 9:45 a.m., January 21, 1947 during a sudden violent snow squall which was accompanied by remarkably low, thick clouds. In this instance, a reading of 48 foot-candles was obtained. The period of relative darkness lasted, however, only about five minutes. Light intensities measured during a snow storm on an unusually dark day are shown in Fig. 18. It will be observed that the lowest light intensity recorded during the early afternoon was 61 foot-candles and that lower intensities occurred only toward sunset.

It is difficult to ascertain to what extent the low intensities which occur during the middle of the day may be further reduced by shade in some parts of the sparrow's environment. On a sunny summer day, a sparrow might hop from a densely shaded spot beneath a shrub where the light intensity was perhaps 15 foot-candles, into the direct sunlight where the light intensity was as high as 8,000 to 9,000 foot-candles. The photoperiodic response of the sparrow takes place mainly during January, February, and March and at this time of year, because of the absence of leaves and the reduced intensity of sunlight, the contrast between shaded and unshaded areas is smaller than during the summer. The sparrow is a bird of the open and even an overcast sky is sufficiently luminous in the winter in the vicnity of Boston to keep the light intensity in the open shade far above 10 foot-candles at all times of day except early morning and late afternoon. It is safe to say, therefore, that in New England, with the exception of certain instances such as a sparrow's going into a barn during the middle of the day, light intensity ordinarily modifies the photoperiodic response of the male sparrow only near sunrise and sunset.

The English sparrow is a wide-ranging species. It occurs as far north as the Arctic Circle (Dementiev, 1934) and it is entirely possible

that during the winter at such a high latitude, fog or heavy clouds might reduce the light to an intensity below 10 foot-candles during the middle of the day. The relatively low intensity of winter sunlight at high latitudes may, however, have little effect on the photoperiodic response of the sparrows living there, because these birds may be adapted to respond photoperiodically to a lower range of light intensities than members of the same species living as far south as New England.

From the facts discussed above, it is apparent that in the vicinity of Boston during the winter the intensity of sunlight falls below the level which evokes the maximum photoperiodic response from the male sparrow only near sunrise and sunset. The range of light intensities which evokes a differential photoperiodic response is minute when compared with the total range in intensity of sunlight and the pyrheliometer records of the Bureau of Solar Radiation are recorded on a scale that is of little use in evaluating the low intensities of light near sunrise and sunset. Therefore, numerous measurements of the variation in the intensity of sunlight at sunrise and sunset were made with a Weston Illumination Meter during the winters of 1945–46 and 1946–47.

Light intensities recorded at dawn on a cloudless winter day are shown in Fig. 19. On this day the light intensity passed 1 foot-candle about 25 minutes before sunrise and 10 foot-candles about 10 minutes before sunrise. The diminution of intensity of sunlight at sunset follows a curve similar to that shown by the increase in light intensity at sunrise. Thus on a clear winter day in the vicinity of Boston, the length of time during which the intensity of light is greater than 1.0 foot-candle may exceed the time from sunrise to sunset by as much as 50 minutes, and the length of time during which the intensity is more than 10 foot-candles may exceed the time from sunrise to sunset by as much as 20 minutes. These figures compare favorably with those of Greulach (1942) who made some similar measurements.

The diminution in light intensity at dusk on a cloudy winter day is shown in Fig. 20. On this day the light intensity fell below 10 foot-candles approximately 10 minutes before sunset and fell below 1 foot-candle approximately 8 minutes after sunset.

The changes in the effective photoperiodic day length caused by the variation in light intensity at dawn and twilight during a clear day and a cloudy day are summarized in Table 17. It will be observed that the difference between a clear day and an overcast day may cause an alteration in the effective photoperiodic day length almost as great

as the seasonal change in the length of day during the month of January.

Presumably when sparrows are asleep very little light of low intensity could pass through their closed eyes and stimulate the photosensitive system within the brain, but when they are awake and have their eyes open, even if they have already gone to roost, light of low intensity could still cause photoperiodic stimulation. Therefore, unless one actually knows when the birds open their eyes in the morning and close them at night, it cannot be stated with any precision to what

TABLE 17

MODIFICATION OF EFFECTIVE DAY LENGTH BY CLOUDINESS

	Cloudy day Dec. 30	Clear day Jan. 17	Difference
Day length[1]	9 hr. 07 min.	9 28	21
Period with light intensity >10.0 f.c.	8 47	9 48	1 01
Period with light intensity >0.7 f.c.	9 23	10 18	55
Difference between day length and period with light intensity >10.0 f.c.	—20	20	40
Difference between day length and period with light intensity >0.7 f.c.	16	50	34

[1] day length = sunrise to sunset
Difference in day length between Jan. 1, and Jan. 31, = 48 minutes

extent the irregular day-to-day variation in the photoperiodically effective day length caused by cloudiness can alter the time of year at which the male reaches full spermatogenic activity. In the present study, it was found that the effective day length for the sparrow starts before sunrise. During January, 1947, sparrows were repeatedly seen and heard before sunrise when the light intensity was less than 2 foot-candles. In the late afternoon, however, the end of the effective day length is not readily determined. During the winter months, the birds go to roost before sunset when the light intensity is usually far in excess of 10 foot-candles. For those individual birds which roost in barns or other buildings, the time of going to roost probably marks

the end of the effective day. Most of the sparrows in and about Cambridge, Massachusetts, however, roost in the ivy on the sides of buildings. During the winter this ivy has no leaves and as a result, most of the sparrows roosting in it occupy relatively exposed positions. Consequently, for them the effective day length is ended not by the time of going to roost, but either by the time when the birds close their eyes to sleep, or by the time when light intensity falls below the threshold for the photoperiodic response. Unfortunately, whether or not the birds close their eyes before the light intensity falls below the photoperiodically effective level has not been determined in this study. All that can be stated is that if during the winter the birds after going to roost keep their eyes open until the light falls below 0.7 foot-candles, the difference in light intensity between cloudy and clear days may cause almost as great difference in the effective day length of two consecutive days as the seasonal change in length of day during an entire month in early winter.

From this it can be speculated that in a year in which most of the days were clear, it would be possible for male sparrows to reach reproductive competence at an earlier date than in a year in which most of the days were cloudy.

As previously discussed, during the fall the range of light intensities which evoke a differential gonadal growth is much greater than in the winter. Therefore, it is of interest that Riley (1937) reports a situation which is perhaps best interpreted in terms of seasonal variation in the intensity of sunlight. In the fall, testicular size in the sparrow is at or near its minimum, but Riley states, ". . . . at the end of the so-called Indian summer in November, the house sparrow [English sparrow] in Iowa experiences a mock breeding season. The bill darkens and the testes show enlargement." At this time of year there are quite numerous spermatogenial mitoses in wild birds killed for examination, but the recrudescence is only temporary and the testes soon regress to their normal winter condition. Since it is generally agreed that the gonadal cycle of the sparrow is independent of environmental temperature, this testicular activity is probably caused by some factor other than the warm weather of Indian summer. It is possible that the clear weather at this season causes an extension of the effective photoperiodic day length and that the lengthened days cause the slight gonadal recrudescence.

This "mock breeding season" is of no ecological significance at the latitude of Iowa where the observations were made, but it is of theoretical importance in that it gives evidence that seasonal variation in

light intensity can effect the reproductive physiology of the English sparrow and further it suggests the possibility that under favorable climatic conditions, i.e., at low latitudes, the sparrow might be capable of breeding during the late fall.

The *Smithsonian Meteorological and Physical Tables* give the intensity of zenithal moonlight as 0.02 foot-candles. In the experiments reported above, it was found that an intensity of 0.04 foot-candles produced only very slight gonadal growth. Therefore, even if male sparrows were awake and as a result had their eyes open for several hours per night during the light of the moon, their photoperiodic response would not be appreciably accelerated.

It is apparent that the importance of the effect of variation in the intensity of light in nature on the photoperiodic response of the English sparrow, cannot definitely be established but the differential gonadal response to various light intensities shown by English sparrows clearly has an important application to laboratory experimentation. When this effect is ignored, experimental results are open to question. As an example, Perry (1938) exposed juvenile English sparrows to 10 hours of light from a 25-watt incandescent lamp added daily after dark for 60 days and found that this exposure resulted in no more gonadal growth than an exposure of three weeks to 10 hours daily of added light from an ultraviolet sunlamp. From this he concluded that under natural conditions, ultraviolet radiation is an important stimulant to gonadal activity. The "Sperti" sunlamps he used, however, have a much higher luminous intensity than 25-watt incandescent bulbs. Consequently, his results might well be explained in terms of intensity rather than wave-length.

In the preceding discussion it has been shown that although the variation of light intensity in nature can cause a difference between the effective length of two consecutive days which is as great as the seasonal change in day length during the month of January, the ecological significance of this fact cannot at the present time satisfactorily be determined. Despite this fact the differential effect of various light intensities is sufficiently marked that it must always be borne in mind in laboratory experimentation.

E. THE EFFECT OF DAY LENGTH ON SEASON OF REPRODUCTION

It has been demonstrated that there is a correlation between day length and sexual periodicity in many animals, but the extent of this correlation and its significance in the determination of the time of

breeding under natural conditions has not been precisely established for any vertebrate.

Baker (1938b) after a comprehensive survey of the breeding seasons[1] of Old World birds which have a wide latitudinal distribution says, p. 583:

"Despite all the intensely interesting experiments on the effects of light on the reproduction of birds, . . . clearly length of day stands in no direct and obvious relation to the breeding seasons of birds under natural conditions. One is forced to the conclusion that light is only one of the factors concerned. . . . An internal cause affecting (but not completely controlling) the onset of the breeding season is the internal rhythm, which is sometimes so strong as to cause a southern-hemisphere bird to breed at the locally "wrong" time of year when introduced in the northern hemisphere (Baker and Ranson, 1938). Internal rhythm probably often plays an important part in determining the onset of the breeding season a considerable time before the external proximate causes stimulating reproduction are beginning to be effective."

As previously discussed, the English sparrow shows a seasonal variation in its response to artificially lengthened days. On the basis of this fact, Riley (1936:332) said, "In adult male sparrows an intrinsic sexual rhythm seems to be established which, through environmental factors merely becomes synchronized with the seasons." There can be no doubt, however, that in nature, as well as in the laboratory, day length does profoundly effect gonadal activity in this species. A "natural experiment" has been performed by the introduction of the English sparrow into New Zealand where its season of reproduction has changed to conform with spring in the southern hemisphere (Baker, 1938a).

In the present study it was shown that day lengths of 10, 12, 14, 16, and 24 hours cause progressively greater gonadal development, with the largest difference in response being between 12 and 14 hours. Thus, the longer the day, the stronger the photoperiodic effect. It was also shown in the present study, however, that the male sparrow can reach full breeding condition during the winter even when kept in the laboratory on day lengths as short as 10 hours. Moreover, under

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[1] In this study, Baker correlated egg-season with day length, because data on the time of egg-laying is readily available in the literature. Although Baker does not discuss this point, it should be noted that to determine the relationship between day length and time of breeding of a species of bird, one should consider not the egg-season, but the time of year when the sex which has the most pronounced photoperiodic response reaches reproductive competence. The latter time may precede the former by as much as a month.

natural conditions, male sparrows will attain full spermatogenic activity at a time of year when the length of day has not yet reached 12 hours. In Oklahoma (Allender, 1936b), multiplication of the germ cells begins by the first of January (day length, 10 hours); primary spermatocytes appear by the middle of January, and by the first of February (day length, 10½ hours) "all stages of development of the spermatozoa are present and the sperm are forming bundles". By the first of March (day length, 11⅓ hours) full spermatogenic activity has been achieved. Thus mature sperm are present when the days are only 10½ hours long and full breeding condition has been reached before the day length reaches 12 hours.

In the latitude of Oklahoma, days are longer than 10½ hours for almost 9 months of the year. Consequently, during ⅔ of the year the day length is sufficient to allow the sparrow to produce mature spermatozoa, and for the remaining ⅓ of the year, since spermatogonial mitoses can occur when the days are only 10 hours long, the day length is sufficient to allow some gonadal activity. The sparrow of course does not experience gonadal activity throughout the year; in the north temperate zone, its principal time of breeding extends from April through July. Therefore it seems reasonable to assume that under natural conditions, an internal control of the time of reproduction is important in this species.

The male English sparrow loses reproductive competence near the end of July and from that time until the middle of November or the first of December it is refractory to increased day length. Immature male sparrows experience a similar, but partial, refractory period extending at least to the first of December. Thus for 4 months of the year, the internally controlled condition of the male sparrow causes it to be relatively independent of day length. Since testicular development will occur when the day length is only 10 hours, in latitudes where days shorter than 10 hours do not occur, gonadal development probably begins as soon as the refractory period ends. In such a case, the initiation of gonadal activity is internally controlled rather than externally controlled. Farther north where days shorter than 10 hours do occur, the initiation of gonadal development may be caused by increased day length, but even there, only a small segment of the period of increasing day length is necessary to bring males of this species to reproductive competence, because males (except in the extreme north of the range of the species) are usually in full breeding condition by the vernal equinox. Thus over much of the range of the

species, the increase in day length between March 21 and June 21 has no further effect on the male.

The fact that the male sparrow is photoperiodically stimulated by day lengths as short as 10 hours and may reach full reproductive condition before the days are 12 hours long reduces the importance of "long days", i.e., days with more than 12 hours of light, yet since the sparrow breeds in the spring, it clearly does not breed when day length is decreasing; and presumably, if it is like the starling, it is not affected by change in day length, but by absolute day length. Moreover, the internally controlled refractory period plays an important role in determining the season of breeding. Nevertheless, all this does not mean that the photoperiodic response is unimportant in this species. On the contrary, it is of great importance, because as the days become longer, the photoperiodic response results in an increasing production of gonadotropic hormones which insures that all male sparrows will reach full breeding condition sometime during the spring rather than at some other time of year, and this in turn determines that the refractory period will extend from midsummer to late fall. Thus, the progressively lengthened days in the spring reinforce the internal rhythm and synchronize it with seasonal environmental changes. As a result, in the temperate zone the season of reproduction of this species is determined in large measure by day length.

Near the equator where seasonal variations in day length are slight, the internal reproductive rhythm would, however, be only slightly affected by changes in length of day. As a result of this relative independence of environmental control, members of the sparrow population in the tropics could gradually get out of phase with the solar cycle, and eventually individuals would be in breeding condition in every month of the year — presumably each bird would have but a single breeding period each year. This theory can account for the fact that in Ceylon, latitude approximately 9.5° N., English sparrow sbreed throughout the year (Baker, 1938a).

Thus, in the English sparrow day length reinforces the internal reproductive rhythm and insures that all males reach reproductive competence in the spring. This spring breeding season determines the period of reproductive refractoriness and the end of the refractory period determines the time when the sparrow can respond sexually to environmental stimuli. Consequently in this species the time of reproduction appears to be controlled by the inter-relationship between seasonal change in day length and internal reproductive rhythm.

SUMMARY

1. The effects of light intensity and day length on reproduction in the English sparrow were studied quantitatively in the laboratory and the ecological significance of these factors in controlling the breeding season of this species in nature was considered.

2. A quantitative evaluation of the effects of 5 different intensities of light, 0.04, 0.7, 10, 52, and 244 foot-candles was obtained by exposing sparrows to these light intensities during uniform day lengths of 16 hours. In the male 10 foot-candles was more effective than either of the lower intensities and was as effective as either 52 or 244 foot-candles in causing gonadal development in the winter. During the fall, however, 10 foot-candles was much less effective than 244 foot-candles, indicating a seasonal variation in response to light intensity. The minimum light intensity which caused full spermatogenic activity was 0.7 foot-candles, but slight testicular activity was caused by 0.04 foot-candles.

3. Experiments testing the effect of the light intensities listed above during 16-hour days showed that in the female, as in the male, gonadal growth increased with increasing intensity. These experiments, limited to the winter, showed that after 46 days, the highest intensity used (244 foot-candles) caused more ovarian development than any of the lower intensities. By 86 days, however, gonadal regression had set in and ovarian size was no longer correlated with light intensity. This confirms the observations of previous investigators that light alone will not cause full ovarian development in this species.

4. The effect of light intensity during uniformly short days was investigated and it was found that 270 foot-candles was no more effective than 25 foot-candles in causing testicular development after an exposure of 25 days to 10 hours of light per day during winter.

5. A quantitative evaluation of the effects of different lengths of day was obtained by exposing male and female sparrows to day lengths of 10, 12, 14, 16, and 24 hours at a uniform light intensity. In the male, gonadal development increased with day length. During an exposure of 18 days the greatest relative increase in testicular response occurred between day lengths of 12 and 14 hours; days longer than 14 hours produced little further development. During an exposure of 46 days, however, it was shown that males could be brought to full breeding condition in winter by a day length of only 10 hours. In the female, as in the male, gonadal growth increased with increased day length, but during a 30 day exposure the greatest relative increase in

ovarian development occurred between day lengths of 16 and 24 hours and no ovarian growth occurred on day lengths of 8 or 10 hours. During an experiment lasting approximately 3½ months females kept on a uniform day length of 8 hours showed no gonadal growth.

6. The difference in the degree of reproductive response of males and females to light is probably explained by the fact that the testis responds to lower concentrations of gonadotropic hormones than does the ovary, rather than by a difference in the sensitivity of the male and female pituitaries to light.

7. Light intensity in nature falls low enough to modify the photoperiodic response of the sparrow only near sunrise and sunset. The presence or absence of clouds may cause a difference between the photoperiodically effective length of consecutive days which is as great as the seasonal change in day length during the month of January.

8. In the English sparrow an internal rhythm is important in determining the breeding season. Increased day length in the spring reinforces this internal rhythm and insures that all males reach reproductive competence in the spring rather than at some other season. The time of onset of breeding determines the onset of the reproductive refractory period. Consequently, the spring breeding season causes this refractory period to occur during the fall and early winter. The end of the refractory period in turn determines the time when the sparrow can again respond to day length. As a result, in this species the season of reproduction is controlled by the interrelationship between the seasonal change in day length and the internal reproductive rhythm.

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PLATES

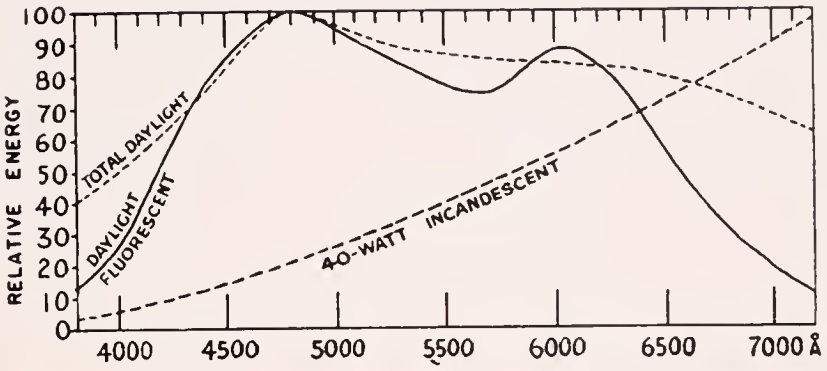
PLATE 1

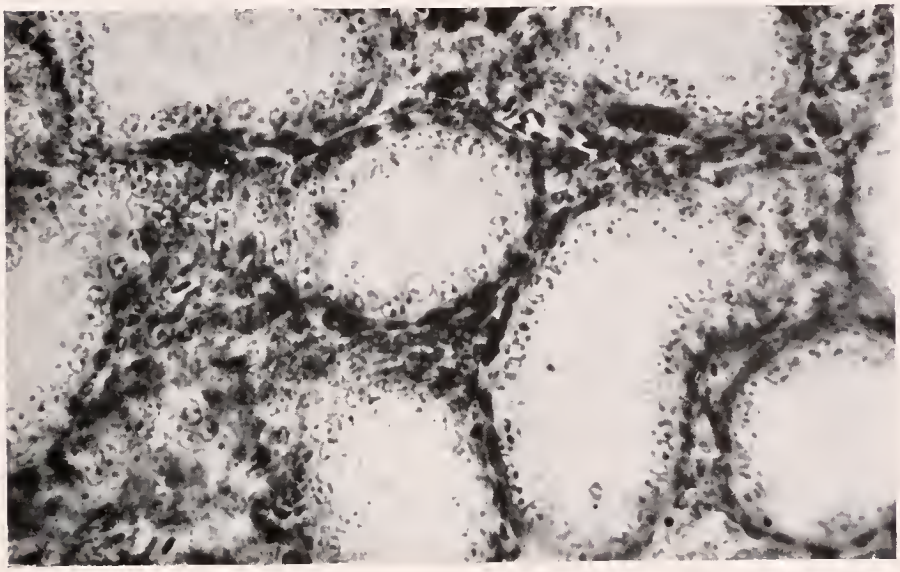
PLATE 1

Fig. 1. A comparison of the light from an incandescent tungsten lamp and the light from a "Daylight Fluorescent" lamp with sunlight. (Adapted from Bulletin LD-1 of the General Electric Company.)

Fig. 2. Spermatogenic class I. Resting spermatogonia only. X 450.

Fig. 3. Spermatogenic class II. Spermatogonia dividing, but only a few spermatocytes present. X 450.


RELATIVE ENERGY
100
90
80
70
60
50
40
30
20
10
0
TOTAL DAYLIGHT
DAYLIGHT FLUORESCENT
40-WATT INCANDESCENT
4000
4500
5000
5500
6000
6500
7000 Å



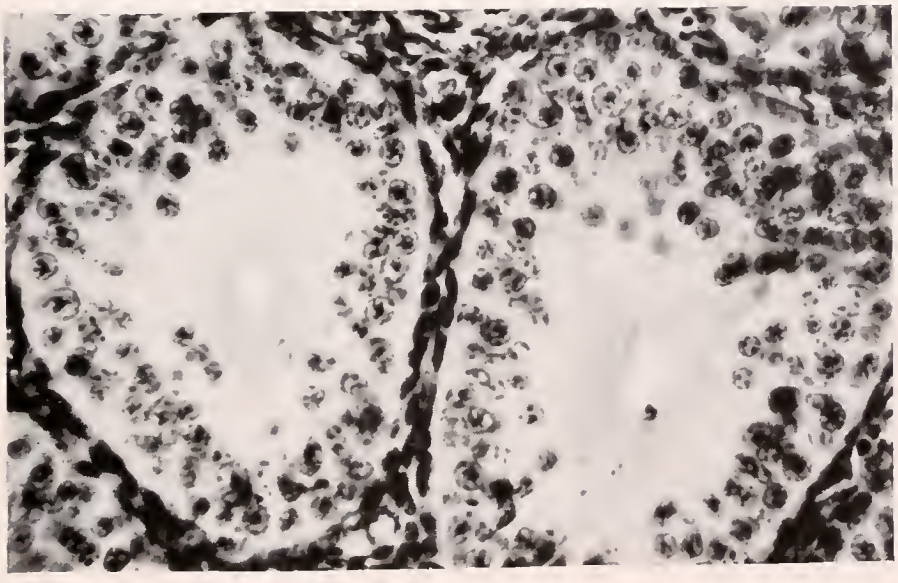
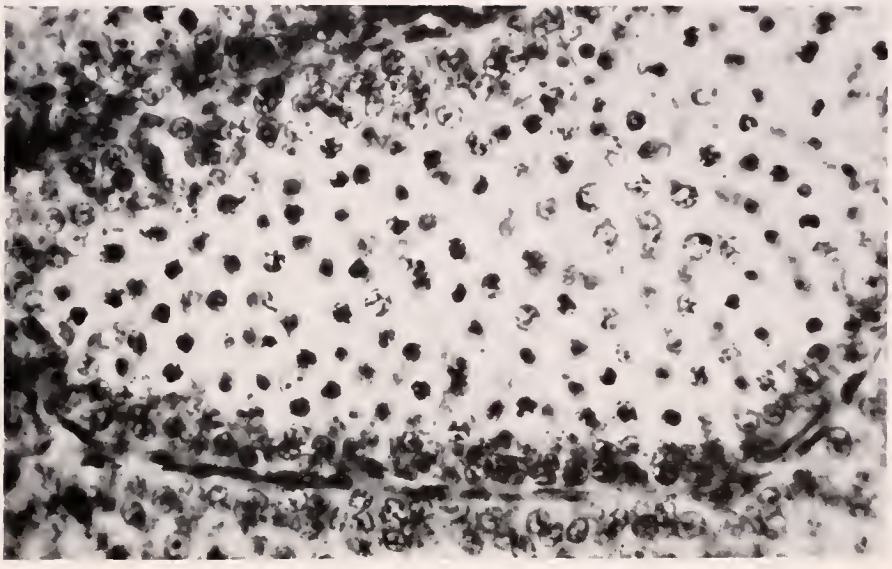
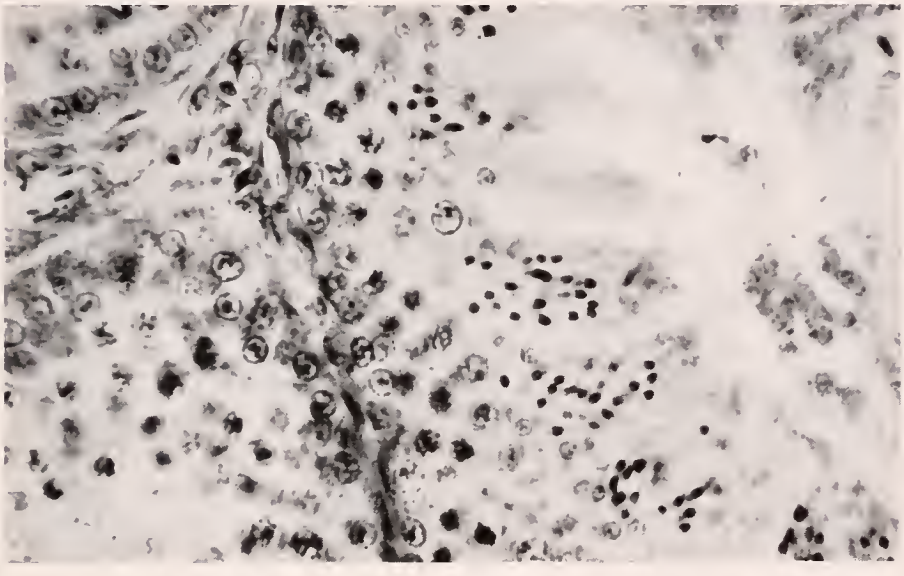


PLATE 2

PLATE 2

Fig. 4. Spermatogenic class III. Many spermatocytes. X 450.
Fig. 5. Spermatogenic class IV. Spermatocytes with spermatids. X 450.
Fig. 6. Spermatogenic class V. Spermatids with a few sperm. X 450.





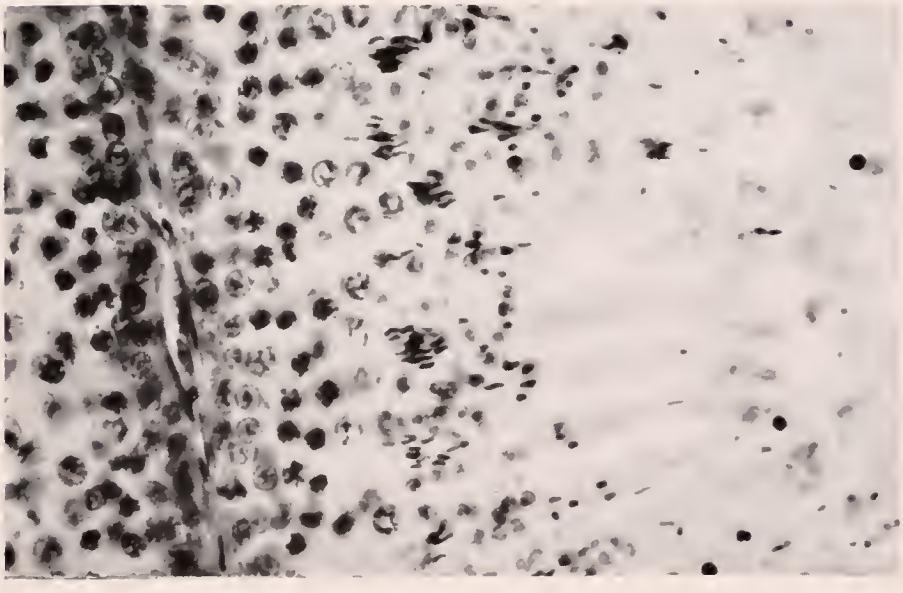


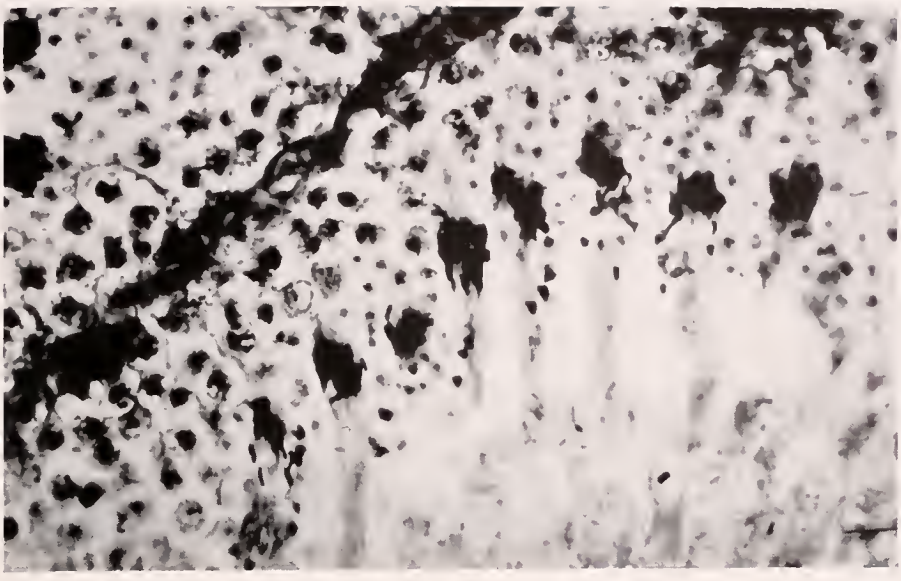
PLATE 3

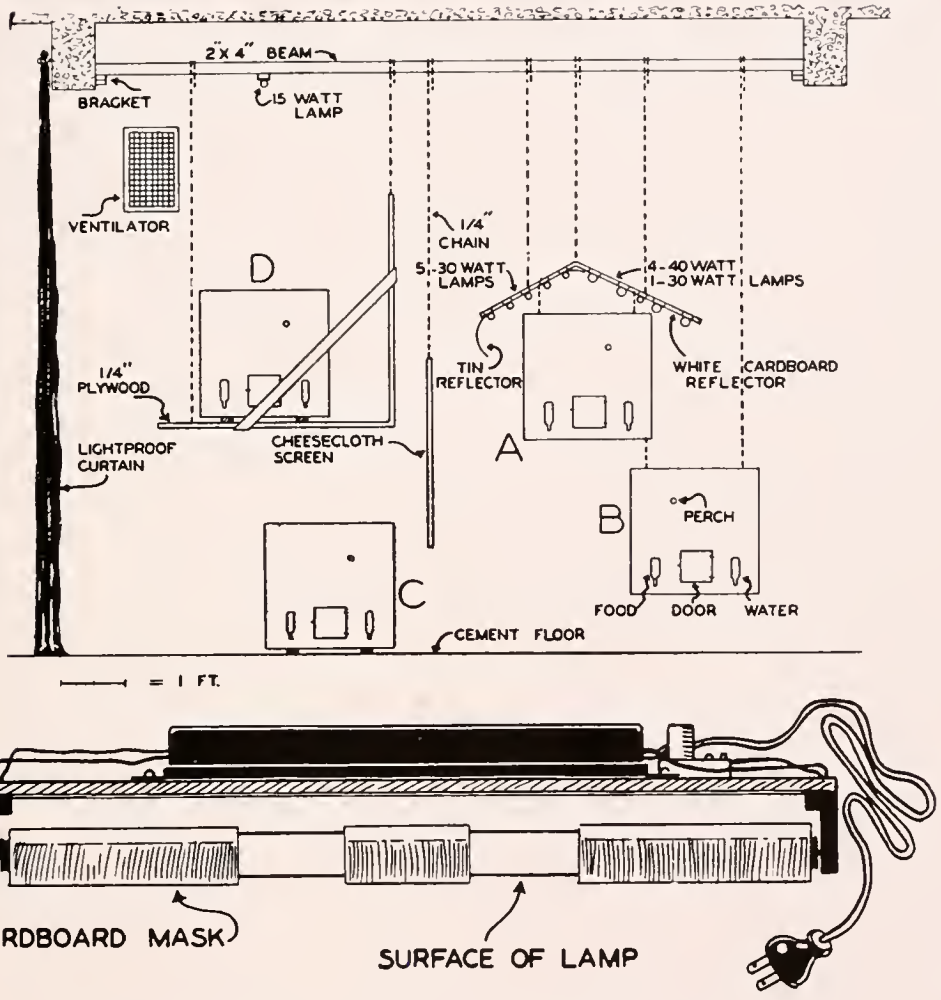
PLATE 3

Fig. 7. Spermatogenic class VI. Full spermatogenic activity with many sperm. X 450.

Fig. 8. Arrangement of the cages and lights used in the light intensity experiments.

Fig. 9. Method of masking fluorescent lamps.





METHOD OF MASKING FLUORESCENT LAMP

PLATE 4

PLATE 4

Fig. 10. The effect of light intensity on testicular weight during 16-hour days in winter.

Legend

The unit of relative weight is the ratio of the mean weight of the left gonads of the controls to the weight of the left gonad of the experimental bird.

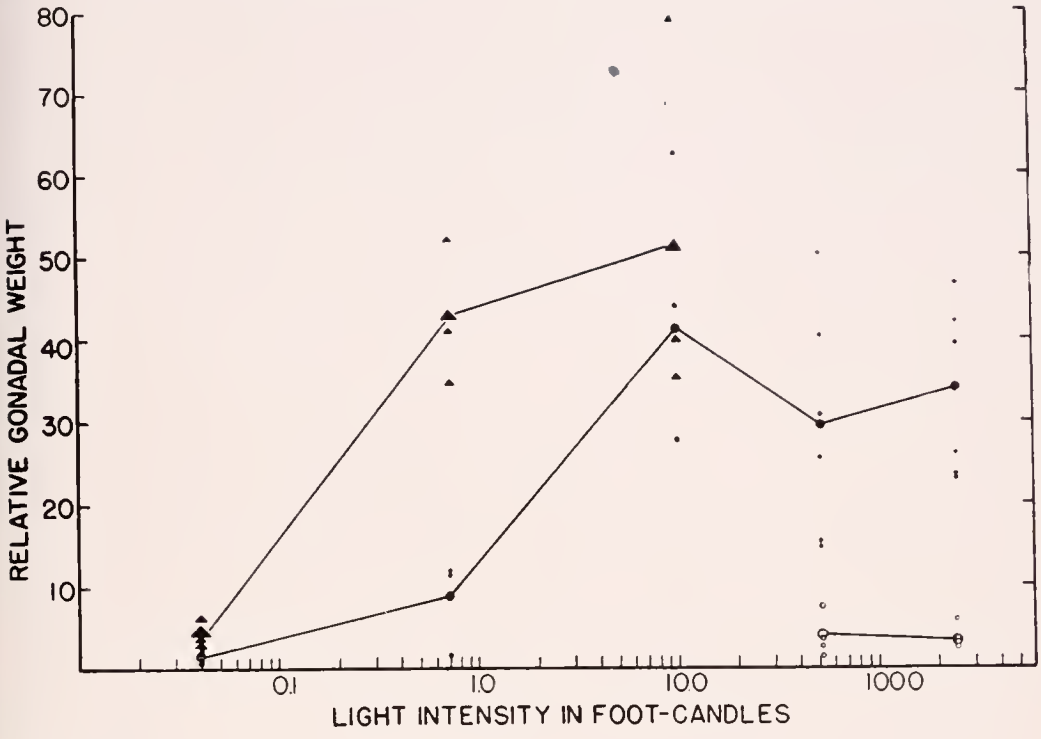
○ 11-day experiment
● 25-day experiment
▲ 46-day experiment

The means of the relative weights caused by each light intensity are connected by lines.

Fig. 11. The effect of light intensity on testicular weight.

Legend

Units are the same as in Fig. 10.
● after 25, 16-hour days during the fall
○ after 25, 10-hour days during the winter
The means are connected by lines.


80
70
60
50
40
30
20
10
RELATIVE GONADAL WEIGHT
0.1
1.0
10.0
1000
LIGHT INTENSITY IN FOOT-CANDLES

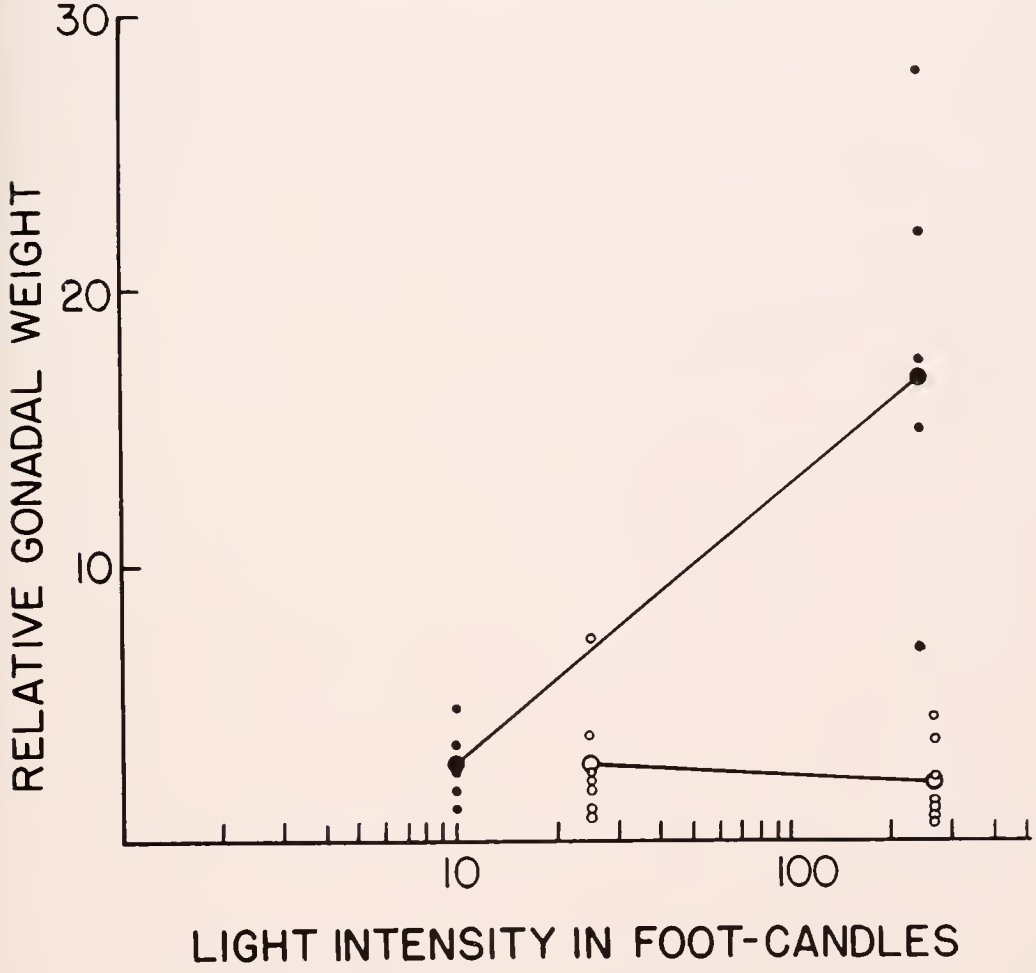

30
20
10
RELATIVE GONADAL WEIGHT
10
100
LIGHT INTENSITY IN FOOT-CANDLES

PLATE 5

PLATE 5

Fig. 12. The effect of light intensity on ovarian weight during 16-hour days in winter.

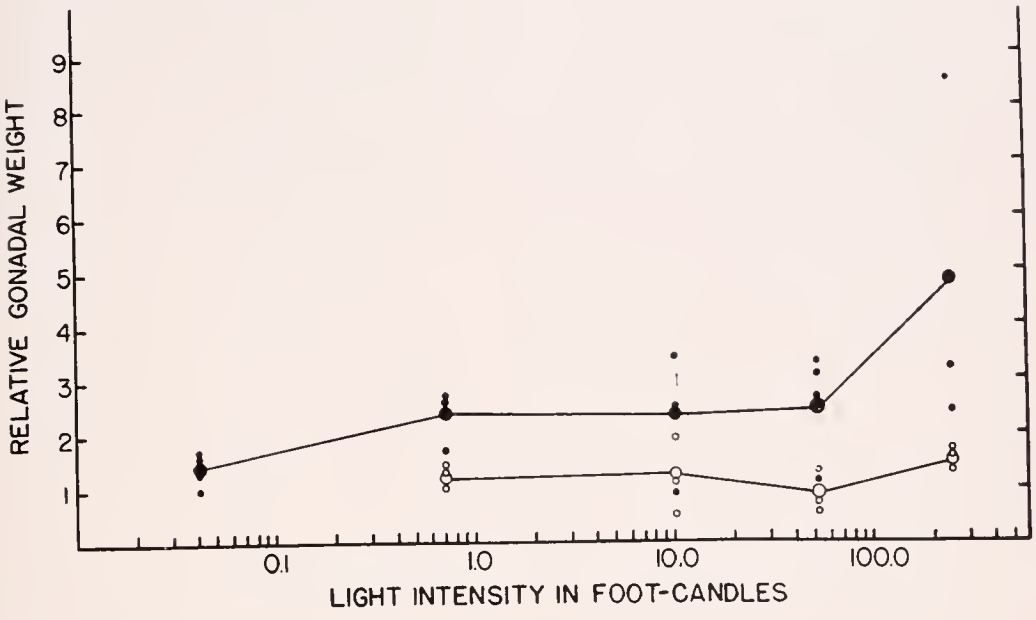
Legend

Units are the same as in Fig. 10.
● 46-day experiment
○ 86-day experiment
The means are connected by lines.

Fig. 13. The relation between weight of oviduct and light intensity during 16-hour days in winter. Relative weight determined as in case of gonads (see Fig. 10).

Legend

● 46-day experiment
○ 86-day experiment
The means are connected by lines.


RELATIVE GONADAL WEIGHT
9
8
7
6
5
4
3
2
1
0.1
1.0
10.0
100.0
LIGHT INTENSITY IN FOOT-CANDLES

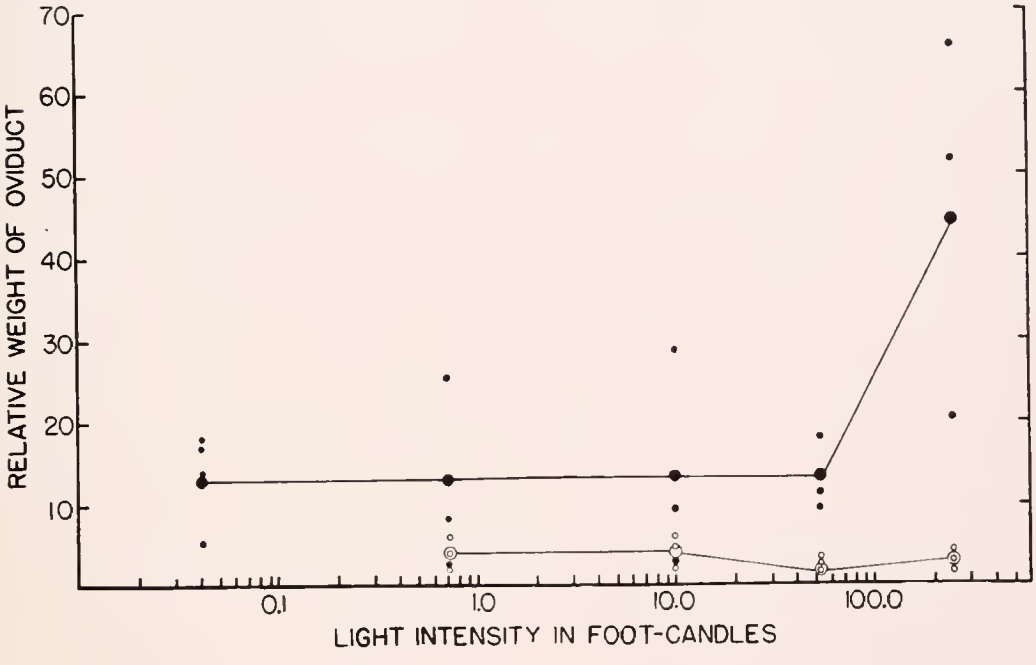

RELATIVE WEIGHT OF OVIDUCT
70
60
50
40
30
20
10
0.1
1.0
10.0
100.0
LIGHT INTENSITY IN FOOT-CANDLES

PLATE 6

PLATE 6

Fig. 14. Comparison of resting condition of female reproductive organs with the maximum development produced by light in the present study (X 2¼).

Fig. 15. The effect of day length on testicular weight.

Legend

Units same as in Fig. 10.

o——o means

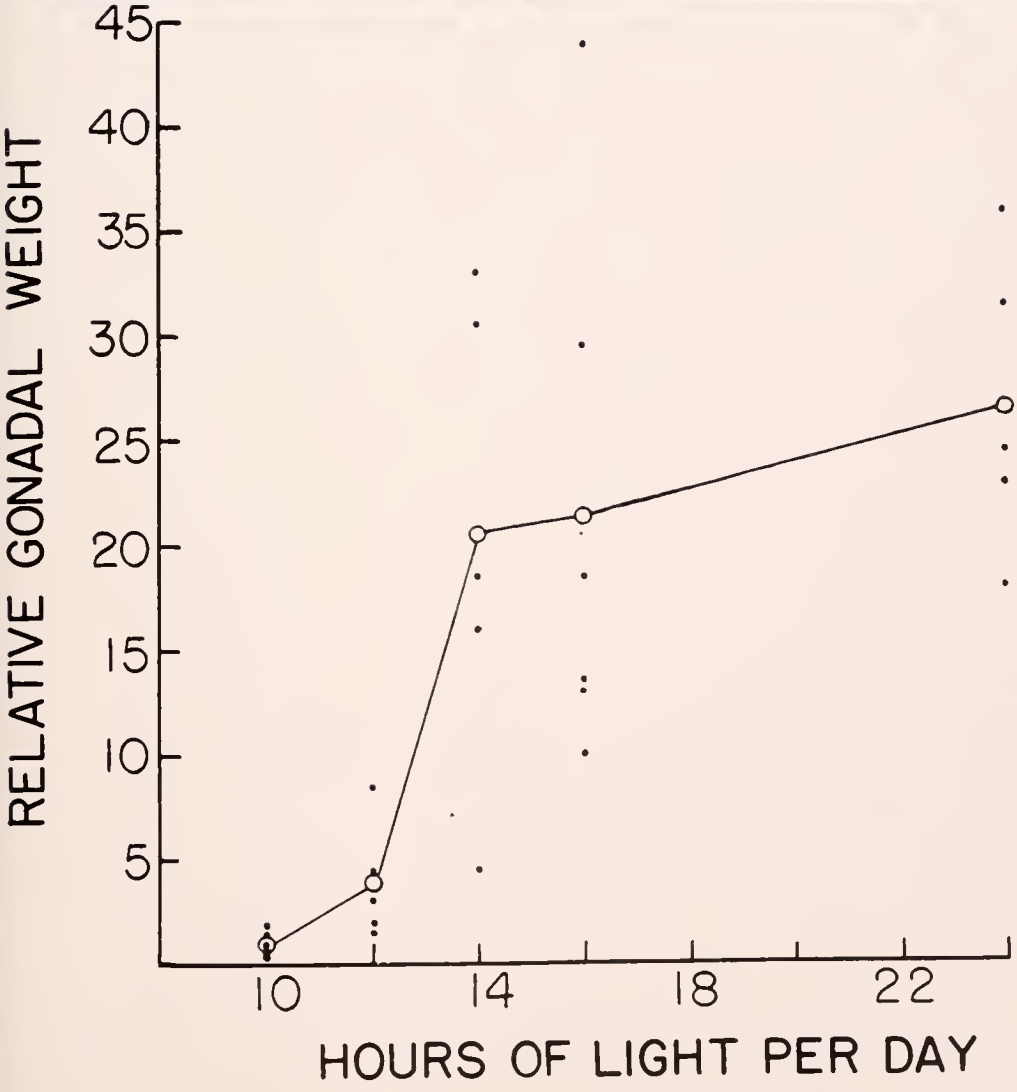

RELATIVE GONADAL WEIGHT
45
40
35
30
25
20
15
10
5
10
14
18
22
HOURS OF LIGHT PER DAY

PLATE 7

PLATE 7

Fig. 16. Effect of day length on ovarian weight.

Legend
Units as in Fig. 10.
o——o means

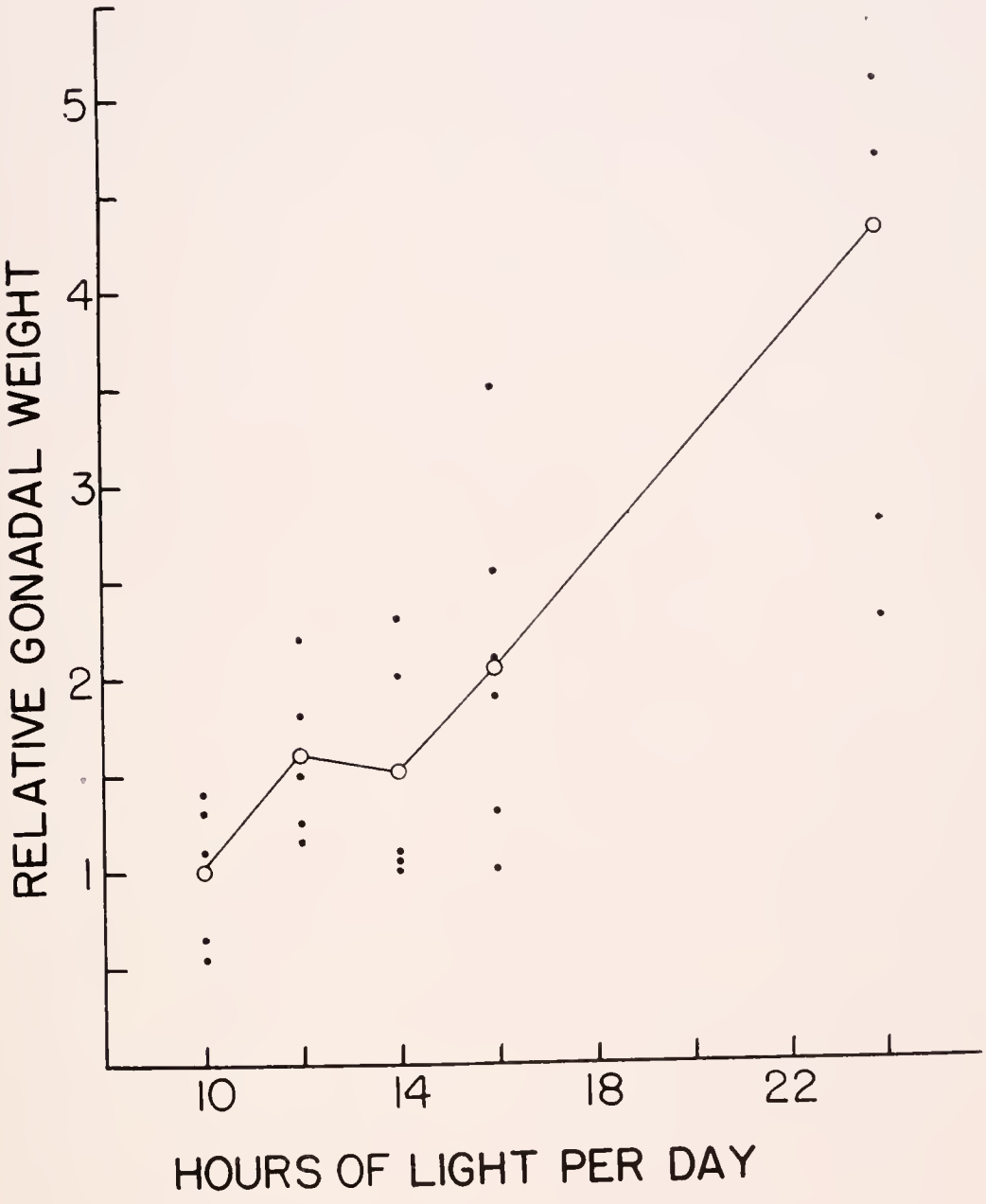

RELATIVE GONADAL WEIGHT
5
4
3
2
1
10
14
18
22
HOURS OF LIGHT PER DAY

PLATE 8

PLATE 8

Fig. 17. The relation between day length and weight of oviduct. Relative weights determined as in case of gonads.

Legend
o——o means

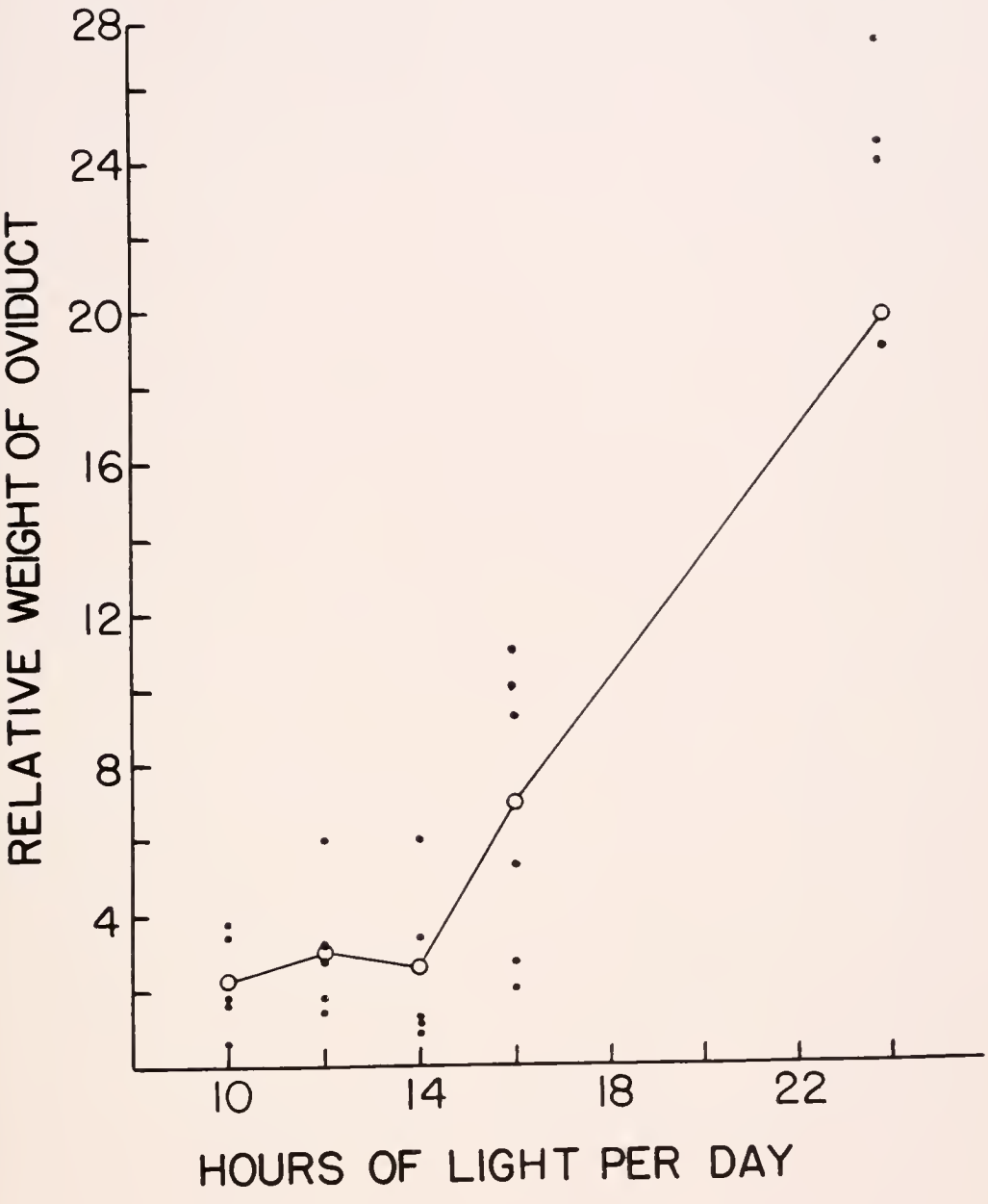

28
24
20
16
12
8
4
RELATIVE WEIGHT OF OVIDUCT
10
14
18
22
HOURS OF LIGHT PER DAY

PLATE 9

PLATE 9

Fig. 18. Light intensity during a snow storm on a heavily overcast afternoon, December 29.

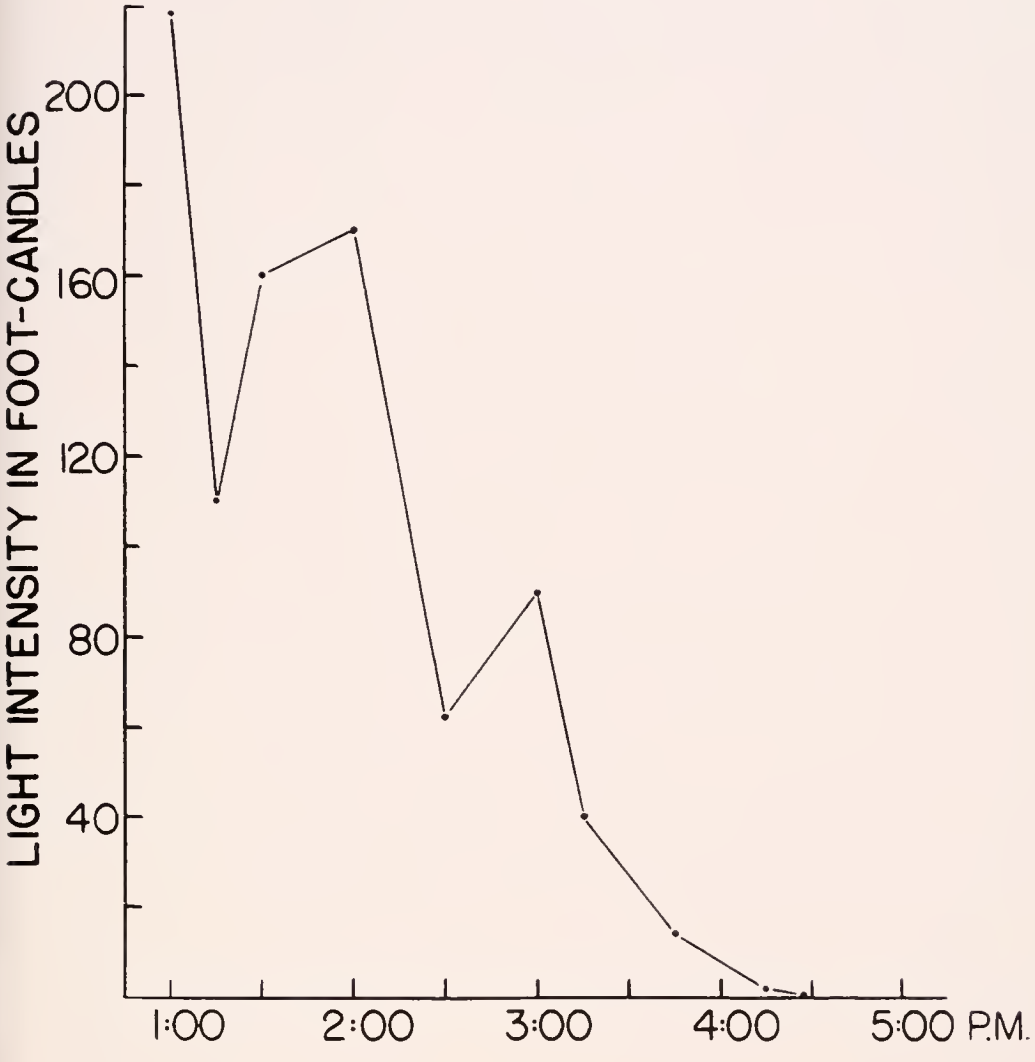
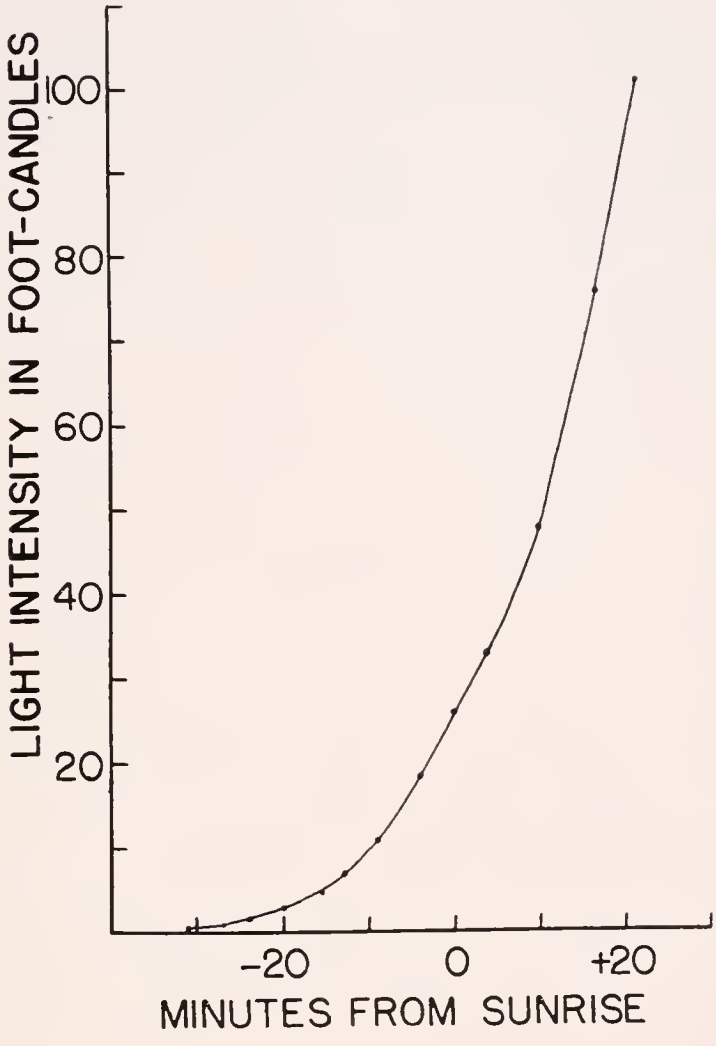
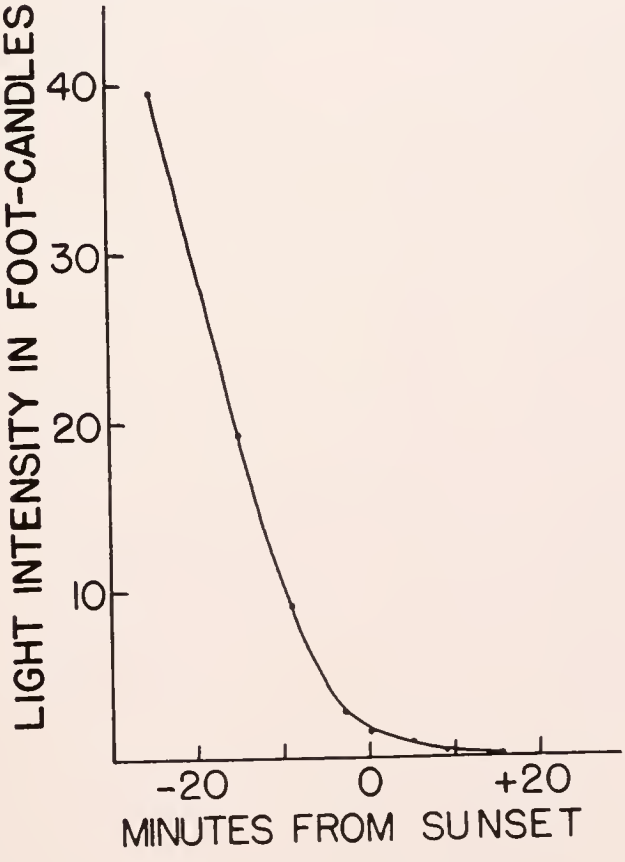

LIGHT INTENSITY IN FOOT-CANDLES
200
160
120
80
40
1:00
2:00
3:00
4:00
5:00 P.M.

PLATE 10

PLATE 10

Fig. 19. Light intensity at dawn on a cloudless day, January 17.
Fig. 20. Light intensity at dusk on a cloudy day, December 30.


LIGHT INTENSITY IN FOOT-CANDLES
100
80
60
40
20
-20
0
+20
MINUTES FROM SUNRISE


LIGHT INTENSITY IN FOOT-CANDLES
40
30
20
10
-20
0
+20
MINUTES FROM SUNSET

Do not circulate

t circulate

Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

Vol. 101, No. 4

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THE NEARCTIC MEMBERS OF THE GENUS *LYCAEIDES* HÜBNER (LYCAENIDAE, LEPIDOPTERA)

By V. Nabokov

With Nine Plates

CAMBRIDGE, MASS., U. S. A.

PRINTED FOR THE MUSEUM

February, 1949

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No. 4. — *The Nearctic Members of Lycaeides Hübner (Lycaenidae, Lepidoptera)*

By V. Nabokov

TABLE OF CONTENTS

	Page
Introduction	479
Remarks on the Eurasian Group	484
Descriptions of the North American Forms	
Lycaeides argyrognomon anna (Edwards)	486
Lycaeides argyrognomon ricei (Cross)	490
Lycaeides argyrognomon lotis (Lintner)	495
Lycaeides argyrognomon alaskensis (F. H. Chermock)	498
Lycaeides argyrognomon scudderi (Edwards)	501
Lycaeides argyrognomon aster (Edwards)	506
Lycaeides argyrognomon ferniensis (F. H. Chermock)	509
Lycaeides argyrognomon atrapraetextus (Field)	511
Lycaeides argyrognomon sublivens subsp. nov.	513
Lycaeides argyrognomon longinus subsp. nov.	516
Lycaeides melissa melissa (Edwards)	520
Lycaeides melissa pseudosamuelis subsp. nov.	529
Lycaeides melissa inyoensis (Gunder)	530
Lycaeides melissa annetta (Edwards)	532
Lycaeides melissa samuelis Nabokov	535
Conclusions	540

INTRODUCTION

The genus *Lycaeides* (*sensu stricto*), belonging to the subfamily *Plebejinae* (also *s. str.*), consists of three polytypic species, of which the first, *argyrognomon* (Bergstrasser, Tutt), is holarctic, the second, *ismenias* (Meigen), palearctic, and the third, *melissa* (Edwards), nearctic.

The classification adopted in discussing these organisms is based on the following principles: 1. When we say that a genus consists of species, and that a species consists of subspecies, each of which again consists of smaller units (minor races or strains, alar or genitalic), we are dealing primarily with certain definite and recurrent aspects (within the general aspect of the genus); these "forms" endure in time

as preserved material for study and in space as living creatures with a definite habitat. 2. A morphological gap between two forms with spatial (geographical, zonal etc.) coincidence or contact, but no interbreeding, is taken to mean absolute specific distinction between them, even if in some other region the two species to which they belong are linked by intergrades. 3. A morphological gap with no spatial contact means either relative specific distinction (i.e. depending on comparisons with allied sets of sympatric forms) or absolute subspecific distinction. 4. When there is spatial contact between two different forms at the limits of their distribution, with some morphological merging there, we have either relative subspecific distinction between the two (i.e. depending on comparisons with allied isolated forms) or some minor racial distinction not requiring a quadrinomial designation. 5. In order to raise the subspecific criterion a peg or so above the subjective level, I have adopted the following rule: a form in the genus under review is subspecifically distinct if separable from any other intraspecific form, already described, by at least two characters, one of which must be either (*a*) male alar (e.g. underside) or (*b*) male genitalic, and the other either male genitalic (if the first be *a*) or female alar (e.g. upperside or shape).

In the present paper I extend the holarctic specific concept *argyrognomon*, as given by me (1944, Psyche for 1943, **50**, p. 87, etc.), to include the Central Asiatic *agnata* (Staudinger), the Eastern Asiatic *subsolanus* (Eversmann) with allied races, and the North American group *scudderi* (Edwards, Nabokov). The palearctic concept *ismenias* as given by recent authors is now extended to include the Central Asiatic *christophi* (Staudinger) and the Aral Sea *bergi* (Kuznetzov).

An ancestral type of *Lycaeides* male armature was deduced by me from a preliminary study of the variation in the genitalia of the palearctic and nearctic forms (1945, Psyche for 1944, **51**, p. 109), and was later discovered to have survived in a butterfly still inhabiting the mountains of Peru (*Paralycaeides* Nabokov, 1945, Psyche, **52**, p. 36). This fact tends to justify the study of the male genitalia for the purpose of tracing the evolution of the various *Lycaeides* forms. Specific formulas for the three species have been worked out by measuring parts (F, forearm, H, humerulus, E, elbow, U, uncus lobe, see Pl. 1, fig. 9) of the male genitalic dorsum (the right half of the uncus as seen from the ventral side) in some 600 specimens. Below is the arrangement I have decided upon. From N ("normal") the *Lycaeides* falx may depart intraspecifically to produce variations W ("weak humerulus") and C ("semicircle"). N is characterized by a more or less

conspicuous, angled or rounded, elbow and a more or less gradual thickening of the humerulus from a breadth slightly excceding the medium breadth (FM) of the forearm. W is angled at the elbow and conspicuously narrowed along the humerulus (to a breadth equal to, or less than FM) before the latter bulges to form the short shoulder. C is evenly rounded at the elbow with a thin F and an equally thin, or thinner, humerulus, which is shaped as in W, the combined effect being that of a slender semicircle. Excluding for the moment certain transitional forms from Wyoming, the three species show the following measurements (in 1/100 mm. units).

argyrognomon. Falx N, with distinct hook. F short to long (32–52), from equal to H to 1.5 times longer, and from thin to very thick (at elbow 5.5–11). H short to long (26–44), and from equal to (or in rare nearctic cases slightly shorter than) U to 1.5 times longer. U short to medium (25–39).

ismenias. Falx N, W or C (but W or C alone when F less than 55), with more or less distinct hook. F medium to very long (43–74), from 1.1 to not quite 1.5 times longer than H, and from thin to fairly thick (at elbow 6–9). H medium to very long (35.5–56), and from 1.02 to almost 1.2 times longer than U. U short to long (26.5–50).

melissa. Falx W or C, with weak hook. F medium to very long (47.5–69), from 1.5 to almost 1.8 times longer than H, and from very thin to medium (at elbow 4.5–7.5). H short to long (32–45.5), and from 1.4 times shorter than U to (in rare cases) equal to U. U medium to long (37–50).

The valve is poor in diagnostic characters. In all three species it has the same variational range in length (measured from proximal point to tip of mentum, in 1/100 mm. units), namely 120–165. The longer valves correspond to a larger wing expanse, so that among the nearctic valves, for instance, the longest occur in *argyrognomon anna.* Breadth fluctuations are: Eurasian *argyrognomon* 45–55, nearctic *argyrognomon* 45–60, *melissa* 45–65. In the breadth of the comb the *melissa-ismenias* range, 13–20, exceeds that of palearctic *argyrognomon*, which is 16–18. In broad comb races (or individuals) of *melissa* and *ismenias* (e.g. certain altitudinal Chinese forms of the latter, or *melissa annetta*) the valve has a thickset appearance due to the whole rostellum being broadened; but in broad-combed races of *argyrognomon* (West Coast nearctic specimens and especially European forms) it is only the comb proper which is affected, the neck of the rostellum remaining comparatively narrow, so that the dorsal part of its tip appears excurvated at the point where the distinctly toothed comb expands. In

other words, an elongated valve with a strongly *retroussé* comb always (as far as my material goes) belongs to *argyrognomon*, while a round-humped, squat valve with an evenly thick rostellum never does. There are, however, a number of less extreme shapes which may occur in any of the three species.

According to my present views, *argyrognomon* is represented in North America by ten multiform intergrading subspecies which may be grouped in three geographical arrays: 1. the Western array (from Central California to British Columbia), consisting of three subspecies (*anna, lotis, riceí*); 2. the Northern or Transcontinental array (from Alaska and British Columbia to the Maritime Provinces), consisting also of three subspecies (*alaskensis, scudderi, aster*); and 3. the Rocky Mts. array (from S. E. British Columbia and S. W. Alberta to S. Colorado) consisting of four subspecies (*ferniensis, atrapraetextus*, and two new subspecies).

The other species, *melissa*, consists of a Western nearctic group of four multiform intergrading subspecies (the widely distributed *melissa*, and three, more local, races, *inyoensis, annetta* and one new subspecies) and of a monoform, isolated Eastern nearctic subspecies (*samuelis*).

While studying the nearctic organs, I have come across an extraordinary case not easily paralleled in the annals of speciation. In the palearctic region *ismenias* and *argyrognomon* occur sympatrically from the Pacific Coast to Central France (only the second reaching Spain), being everywhere separated by a distinct gap in F, a gap which is small (3–7.5) on Honshu Island, medium to large (8–25.5) in East Siberia and very large (17–31) in Europe. In the nearctic region, *melissa* occurs sympatrically with *argyrognomon* from British Columbia eastward to South Manitoba and Minnesota, south-eastward to localities in Montana, Idaho and South Colorado, and southward through the West Coast states to the southern spurs of the Sierra Nevada. They are separated by distinct gaps in F and U; but in the mountains of North-West Wyoming, *argyrognomon*, after producing through a sequence of local forms, a longer F than its palearctic counterpart does, gradually reaches a point of development from which either *ismenias* or *melissa* is evolved, depending on whether it is H or U that grows with F; in other words, a group of intergrading forms is produced, some individuals of which can be classified as "long" *argyrognomon*, others as "medium" *ismenias*, others again as "shortish" *melissa*.

The alar characters of the genus, studied in 2000 specimens, are examined in the light of my work on the morphology of the group

(1944, Psyche, for 1945, **51**); the subspecific divisions now in use are drastically revised, and a number of new forms, to three of which it was found convenient to give subspecific names, are described from material in the Museum of Comparative Zoölogy. The nomenclature of the macular elements is based on my viewing the evolution of the pattern as an intracellular movement distad, a centrifugal succession of waves, a phenomenon of expansion, in opposition to the old and still widely accepted theory (of which Schwanwitch is the foremost modern exponent) of a fixed number of initial transversal lines or bands that break into macules. I am inclined to think that ever since organisms which a modern systematist would have classified as Lycaenids or proto-Lycaenids (or indeed Lepidoptera) have existed macular patterns have been in existence too; while the zebroid patterns, peculiar to certain groups in certain environments, suggest specialized protective adaptations rather than primitive designs. The discovery (see Psyche, **51**, p. 112) of the concentric rings or ripples in which the scales are placed, radiating from a center more or less coincident with the base of the wing, and which I have termed scale-lines (sls.), continues to yield a convenient method for calculating and describing the position of various elements of the pattern. In this respect the "critical cell", Cu_1 of the hindwing, has proved to be most valuable in giving as it were a summary of the main variational characters in a race (see Pl. 2).

I have spent many happy hours looking up bibliographical matters, and the results are given under each subspecies; it was found unnecessary, however, to clutter the synonymy with references to catalogues (Wiedemeyer, 1864; Kirby, 1871, 1877; Edwards, 1872, 1877; Scudder, 1876; Strecker, 1878; Skinner, 1898; Staudinger and Rebel, 1901; Dyar, 1902), mere lists of names (Edwards, 1884; Smith, 1903; Barnes and McDunnough, 1917; Barnes and Benjamin, 1926; McDunnough, 1938; Forster, 1938) and other compilations (Morris, 1862; French, 1886; Maynard, 1891; Draudt in Seitz, 1921, etc.), unless something new or peculiar was added to the history of the forms under discussion.

A number of persons and institutions have loaned me specimens for study, some of which they have allowed this Museum to keep. I have to thank Mr. W. P. Comstock, Mr. E. I. Huntington, Mr. C. F. dos Passos, and the American Museum of Natural History; Professor W. T. M. Forbes and the New York State College of Agriculture at Cornell University; the late R. C. Williams, Jr., and the Academy of Natural Sciences of Philadelphia, for much interesting material. With

the utmost generosity Mr. D. B. Stallings and Dr. J. D. Turner, Mr. Harry K. Clench, Mr. F. H. Chermock, and Messrs. P. S. and C. L. Remington loaned me their choicest specimens of *Lycaeides*, and donated a number of them to the Museum of Comparative Zoölogy. Dr. J. McDunnough and Mr. T. N. Freeman most kindly provided me with specimens of *argyrognomon aster* form *empetri* Freeman, Mr. D. Eff with N. Ohio specimens of *melissa samuelis* Nabokov, and Monsieur H. Stempffer of Paris with a series of *argyrognomon calliopis* (Boisduval), the first consignment of butterflies received here from Europe since the end of the war. Among the Mus. Comp. Zoöl. material, the Weeks Collection (especially the beautiful specimens collected by Signor O. Querci) proved of invaluable assistance in pursuing these studies. Professor Oakes Ames kindly determined for me some plants and Dr. W. S. Creighton an ant.

The following abbreviations are used in the references to collections: SCD—*ex* coll. S. H. Scudder; AGW—*ex* coll. A. G. Weeks; G—*ex* coll. J. D. Gunder; H—*ex* coll. E. I. Huntington; dP—*ex* coll. C. F. dos Passos; ST—coll. D. B. Stallings and J. D. Turner; HC—coll. H. K. Clench; CM—coll. F. H. Chermock; TF—coll. T. N. Freeman; RR—coll. P. S. and C. L. Remington.

REMARKS ON THE EURASIAN GROUP

Without a study of the material, especially Grum Grshmaïlo's types, in London and Leningrad, it is impossible to undertake a thorough revision of the Eurasian group. Forster (1936, Mitt. München. Ent. Ges., **26**), who attempted to do so, relied for the revision of Asiatic forms, which had been vaguely described by Russian workers, upon specimens boldly name-labeled by German dealers, with disastrous consequences. I have figured, however, a few Eurasian forms. Some of them are very little known or not known at all. The Japanese forms are instructive, for instance a male specimen (Pl. 1, fig. 39, left; Pl. 3, fig. 13) of *argyrognomon yarigadakeana* (Matsumura, 1929) from Nikko (VI, 1899, *leg.* Hashimoto, M.C.Z.) which is a transition to the form *yagiana* (Sugitani, 1938) of *ssp. subsolanus*. This form, incidentally, is the same as *montinus* (Yagi, 1915), *nom. praeoc.*, dubbed "*yagina*" by Strand (1922) whose farcical nomenclatorial methods I refuse to accept, and yet another candidate here is *Lycaena asamensis* Matsumura, 1929, which is the same as *shiroumana*, *id.*, *id.*, unless the name applies to a remarkable Karuizawa form of *Plebejus argus* (Linn.) which I have also dissected. Matsumura in this group was as in-

competent as he was prolific. This specimen of *yarigadakeana* is less close to the Hokkaido form, *argyrognomon iburiensis* (Butler), 1881 (which is the same as *ishidae* Matsumura, 1929), than it is to forms from N. E. Asia which I group under *argyrognomon kenteana* (Staudinger, 1892); the Hokkaido representative of *Plebejus argus* has been confused with both *argyrognomon iburiensis* and the Honshu representative of *ismenias*.

An undescribed form of *ismenias* (prep. 138, Pl. 1, fig. 40, right, and Pl. 2, fig. 1; Pl. 3, figs. 21, 22; Pl. 7, figs. 105, 106), sold by Bang-Haas to A. G. Weeks under a fancy name, comes from near Troitzkosovsk in Transbaikalia (Chikoy R., 3000 ft. alt., VII, M.C.Z.) and is the largest form of *Lycaeides* I have seen. One of these males (fig. 21), is interesting because of its remarkable resemblance to *ismenias calabricola* (Verity), which I figure (Pl. 3, fig. 18; Pl. 7, fig. 104) from specimens taken by Querci's family in the coastal range of Calabria (San Fili, Cosenza, 3000 ft. alt., 17. VI. 1920, AGW, M.C.Z.), a beech and bracken region very different from harsh Transbaikalia, four thousand miles away, where the subsoil never thaws.

Of the other Asiatic specimens I shall note *ismenias sinica*, Pl. 4, fig. 25, and Pl. 7, fig. 108, E. Kansu, Hwei-si Tsinling Shan Mts., AGW, M.C.Z. (the male of which had a *Plebejus argus* abdomen neatly glued on by the Staudinger-Bang Haas firm); a curious *ismenias* form (Pl. 4, fig. 26; Pl. 7, fig. 109) from N. Chihli, Tung-Kia-ying-tze, 5000 ft. alt., IX, AGW, M.C.Z., which despite its small size is allied to the Mongolian group; and an altitudinal *ismenias* form (Pl. 4, fig. 27, Szechwan, Tsiling, 11.300—11.500 ft. alt., late VIII, *leg.* Sage, ex A.M.N.H., M.C.Z.) which does not fit the original description of *Lycaena ganssuensis* Grum Grshmaïlo, but is certainly the same as *Lycaena aegina* Leech (preoccupied by L. *aegina* Gr. Grsh., a different form altogether). The most interesting specimen, however, belongs to what is probably a new species linking up this genus with *Plebejus* (see Pl. 1, fig. 41 and Pl. 8, fig. 28). With its short, fat humerulus, non-hooked forearm and unusually large valve, this unique specimen (labeled "Alai, Fergana" by Bang Haas, sold to Weeks as a "very rare *var.*" of a species with which it has not the slightest affinity, and now in M.C.Z., prep. 495) on the upperside resembles *argyrognomon subsolanus* in the reduction of the cyanic overlay to a mere basal and neural dusting.

DESCRIPTIONS OF THE NORTH AMERICAN FORMS

Lycaeides argyrognomon anna (Edwards)

Pl. 1, fig. 17, left; Pl. 4, figs. 33, 34; Pl. 8, figs. 95–97.

Lycaena anna Edwards, 1861, Proc. Acad. Nat. Sci. Philadelphia, **1861**, p. 163, California, from Behr; 1873, Trans. Amer. Ent. Soc. Philadelphia, **4**, p. 348. Strecker, 1874, Lep., p. 88, Calif., rare; Pl. 10, figs. 4, male both sides, 5, female. Edwards, 1882, Papilio, **2**, p. 49. Maynard (*pro parte*), 1891, N. Amer. Butt., p. 161. Wright, 1906, Butt. W. Coast, figs. 384, b, c, both sexes and female underside, Sierra Nevada, *leg.* Wright, VII—1892. F. X. Williams, 1909, Ent. News, **20**, p. 70, N. Calif. (Mt. Shasta region, rather common, always in moist weedy places; vic. Castella, about 10 mi. S. of Upper Soda Springs, Siskiyou Co.), *leg.* Hy Edwards and Behrens. Newcomer, 1910, Ent. News, **21**, pp. 274–275, p. 314, E. Calif. (Lake Tahoe region, rather common in canyons, peculiar to "Canadian Zone" country forested with conifers, 6000–8000 ft. alt., VII–VIII). Seitz, 1922, Grosschmett. Erde, **5**, Pl. 144, figs. in row h (very poor). Holland (*pro parte*), 1931, Butt. Bk., rev. edit., p. 264 (data adapted from Comstock, 1927, *q.v.*), Pl. 66, fig. 21, male, type ("Cal." in Edwards' hand), fig. 22, female, type (*id.*).

Lycaena cajona Reakirt, 1866, Proc. Ent. Soc. Philadelphia, **6**, p. 147, footnote, Calif.

Lycaena argyrotoxus Behr, 1867, Proc. Calif. Acad. Nat. Sci., **3**, p. 281, Sierra Nevada.

Lycaena philemon Boisduval, 1869, Ann. Soc. Ent. Belgique, **12**, pp. 47–48, Centr. Calif., *leg.* Lorquin, on meadow flowers. Oberthür, 1914, Lep. Comp., **9**, figs. 1965, male both sides, 2066, female both sides, types.

Cupido anna Kirby, 1871, Syn. Cat. Diurn. Lep., p. 358. Butler, 1901, Ent., **33**, p. 124.

Plebeius anna Kirby, 1877, *op. cit.*, Suppl., p. 766. McDunnough, 1916, in Barnes and McDunnough, Contrib. Lep. N. Amer., **3**, p. 111, food plant "a yellow-flowering species of *Hosackia* common on moist hillsides in N. Calif." Fox, 1919, Lorquinia, **2**, part 6, p. 10, Tuolumne region (base of Mt. Hoffman). Blevins and Blevins, 1945, Bull. S. Calif. Acad. Sci., **43**, p. 122, Sequoia Ntnl. Park, Centr. Calif., *leg.* Martin.

Rusticus anna Scudder (*pro parte*), 1877, Bull. Buffalo Soc. Nat. Sci., **3**, p. 122, adds Nevada. McDunnough, 1914, Ent. Rec. **26**, p. 202.

Lycaena melissa Holland, 1898, Butt. Bk., Pl. 31, fig. 26, female; 1931, *op. cit.*, rev. edit., expl. Pl. 31, adds "type" (label on specimen, which reads "Mead Collection, Col.", in Holland's late hand, is obviously spurious).

Lycaena lotis Wright, 1906, Butt. W. Coast, fig. 383, c, male both sides, "Mendocino Co." (more likely Mt. Shasta region), Calif., *leg.* Behrens (*trans. ad. ssp. ricei*).

Plebejus anna J. A. Comstock (*pro parte*), 1927, Butt. Calif., p. 183, "a mountain butterfly . . . well-watered areas of the Sierras . . . from approx. Kern Co. northward," late VI to early VIII, not common, Pl. 53, figs. 26–28, male both sides and female, Shasta Co., 27.VI—9.VII.1921. Garth, 1935, Bull. S. Calif. Acad. Sci., **34**, Pl. 67, Yosemite Ntnl.Park, 8200–9400 ft. alt. (Tuolumne and Kerrick Meadows; Coldwater Cn.; McGee Lane Trail to Tenaya L.).

Lycaeides anna Stempffer, 1933, Bull. Soc. Ent. France, **38**, pp. 111–112, text fig. 2, male genit., Yosemite (Glacier Pt.).

Lycaeides argyrognomon anna Nabokov (*pro parte*), 1944, Psyche, for 1943, **50**, pp. 90–91.

The synonymy is on the whole less confused than in the case of some other members of the group. I find that Edwards' paper containing the original description of *Lycaena anna* and *Lycaena scudderii* was published before December, 1861 (see, for instance, Morris, 1862, February, Synopsis Lep. N. Amer., preface), probably in July, 1861 (as an author's separate?). In regard to the models of Holland's figures, Mr. Richard M. Fox and Dr. W. R. Sweadner have kindly checked the labels at the Carnegie Museum.

Specimens examined. California: pair purchased by Scudder from Edwards, M.C.Z.; male co-type of *cajona* Reakirt, M.C.Z. Numerous specimens from the following Californian stations: Gold L., Sierra Co. (VII.1941, ST, Pl. 1, fig. 17, left, and purch. from Sternitzki, M.C.Z.); Summit, L. Tahoe region (V.III.1912, Ac.N.S.Phil., Pl. 4, fig. 34 and ex HC, M.C.Z., Pl. 8, fig. 96); Yosemite (Tuolumne Meadows, ST.; Glacier Pt., 2.VII.1921, M.C.Z., Pl. 4, fig. 33); Deerpark, Placer Co. (11.VIII.1908, Ac.N.S.Phila.); Sequoia Ntnl. Prk. (VII.1943, CM; ST; M.C.Z., Pl. 8, fig. 97); Mammoth Pk., Madera Co. (2.VIII.1940, ST); Mammoth, Mono Co. (25.VII.1920, G, A.M.N.H.); Burney Mt., Shasta Co. (HC); Mt. Shasta, Siskiyou Co. (mid VII.1931, G, A.M. N.H.); and Davis Cr., Modoc Co. (early VII.1928, G, A.M.N.H.). Nevada: male and female (Pl. 8, fig. 95), *ex* coll. Eddy, M.C.Z.

Genitalic measurements. 10 Calif. males (Gold L.; Summit; Tuolumne Mds.; Sequoia Prk.; Mammoth; Davis Cr.) showed the range: F. . .37–43, H. . .32–37, U. . .29–37, E. . .8–10. Less developed than conspecific forms from Eastern Asia, but more robust than Central European forms of the species (although H is longer in the Eurasian group). Curiously close to the Spanish (Nueva Castilla, *leg.* Querci, AGW, M.C.Z.) ssp. *nevadensis* (Oberthür, 1910) to which, incidentally, I sink the "*Plebeius insularis* (*auct., nec* Leach) race *extremata* of Sagarra, 1930 (who wrongly attributed it to the long-falced Eurasian

species), and also the "*Lycaena idas* (Linn., *praeoc.*) *ssp. singularis*" of Heydemann, 1932. Six males of *nevadensis* gave the range: F...37–44. H...33–44, U...27–38, E...5.5–9.5.

Underside components of hindwing cell Cu_1 (*in scale lines*) Male purch. from Edwards, Calif., right hindwing underside. Ground (bluish white)...12. Halo, prox. part...4. Macule (weak)...8. Halo, dist. part...3. Ground...0. Prox. cretule...29. Semimacule (rather weak)...7. Aurora (rather pale; scintillant interpol. in last line; well separated from veins on either side)...5. Praet. mark (small and weak, with patchy scintilla)...8. Term. space...13. Term. line...1 (very weak, but rising rather strongly to 3 on veins).

In fw. length (males 14–17 mm., females 13–17) *ssp. anna* exceeds all other nearctic *Lycaeides* forms, except one to be discussed, but is equalled by many co-specific forms in Eurasia and falls short of Italian and East Asiatic forms of *ismenias*. The underside is powdery white (often tinged with yellowish fawn in the female) and very smooth looking (owing to the wide spaces between the pattern components as well as to the inconspicuousness of the haloes and cretules against the pale ground), with a fair amount of turquoise pulvis, and a general faint bluish cast to the white. The discal macules tend to be reduced, in size and number, with the hw. ones fading out first. Usually the size of the hw. macules is around 1/30 (for the number of hw. sls., see Psyche **51**, p. 135) and in such specimens the fw. macules shift from 1/30 to at least 1/20 (which is the generic norm). However, specimens occur (e.g. some of the Gold L. ones) where the macules are equally reduced (to below 1/30) in both wings, while in other individuals (perhaps racially in the Yosemite region) the hw. macules catch up with the conspicuous (1/20) fw. ones. The cretules are usually long. The hw. semimacules are thin and pointed, and do not vary with the disc; the fw. ones are relatively heavy. Interval I is always narrow with the reduced aurorae seldom distinguishable in fw. and pale in hw. They often do not reach the praeterminal marks, and the rest of the interval may be partially or completely filled with pale scintillant scales overlapping the weak mark proximally. The fairly stable components of the limbal series, taken as a whole, are small and conspicuously separated from each other, the aurorae being quite devoid of outer (neural) cusps. The pale terminal space between the praet. marks and the termen is greater than in other forms. Indeed it would seem that whatever forces moulded this subspecies they were exceptionally favorable to the development of the membrane of the wing, after the racial pattern had been fixed, and unfavorable to the

extension of interval I as well as to the development of the pigmentation. The terminal line is more or less faint, but the inner triangles, which alone are present, may be sometimes quite conspicuous in both wings. Besides these characters, the special "*anna*" appearance is due to the partial or complete obsolescence of the fw. colon ($Cu_2II+1AII$, i.e., the two lower discal macules) combined with the often very interior position of macule Cu_1, the rest of the discal macules producing the effect of a semicircular sweep around and below the narrow discoidal.

In northern California male undersides show a slight fading of the limbal set in hw., transitional to the Oregon forms of the next subspecies with which this one intergrades.

The male upperside calls for little comment. The development of the vadum is from weak to average. There is little tendency to the formation of terminal triangles in hw. and the presence of insulae is unusual.

The female upperside seems of a rather light, diluted, brownish tone because of the sparse distribution of the fuscous scales over a neutral ground, but quite dark (generically normal) specimens seem to predominate in the Sequoia Nat. Park. Except for a few basal scales in some individuals the blue overlay is absent, as it is absent also in the co-specific East Asiatic forms. The upperside aurorae are represented in both wings and, when narrow, appear of a dull yellowish tone (thus in the specimen purch. from Edw.) which clears to a light, rather warm orange yellow when they gain in width. Usually, and in the hw. invariably, they have the appearance of clear cut, more or less narrow arches, and this, in combination with the elongated wing shape, gives the female a characteristic look. With a greater breadth the outline of the aurorae becomes blurred in fw. but remains sharply crenulated in the lagging hw. In proximodistal extension along the interneural fold they vary from 10 sls to 20 in fw. and from 8 to 12 in hw. (though much narrower on the underside) but in both wings the cusps bring the extension along the veins to at least 25 sls.

It might be possible to pick out a few local forms of the female: 1. typical, with fairly narrow distinctly arched aurorae in both wings (L. Tahoe region etc.); 2. narrow fw. aurorae tending to a bar-like shape (i.e. losing their cusps) while remaining typical in hw., this combined with a darker ground (the Sequoia series); 3. extended blurry aurorae in fw., but hw. ones still keeping fairly clear in outline, this combined with reduced maculation in hw. underside (Siskiyou Co.); 4. greatly enlarged aurorae in both wings, the fw. ones broadly fused on the veins (Nevada).

As in many Eurasian forms of the species the terminal fringe in the female is shaded with fuscous but becomes distinctly white at the fw. apex.

The distribution of this subspecies, which has been confused with more northern races, is very imperfectly known. Intergrades with *ssp. lotis* ought to occur in the mountains to the NE of the Sacramento, and various connections with *ssp. ricei*, some of them very close to *anna*, occur in southern Oregon. It is doubtful that it spreads very far east in Nevada. No Eurasian race of the species can compete with *anna* (and *ricei*) in general loss of pigment, but the other Eurasian species, *ismenias*, produces in Central Asia a form (ssp. *christophi*) which shows considerable homoptic resemblance to the west American forms, in spite of the shorter terminal space and more slender build (and a quite different, blue, female).

Lycaeides argyrognomon ricei (Cross)

Pl. 1, figs. 1, 19–21, left; Pl. 4, figs. 35–40; Pl. 8, figs. 98–102.

Lycaena anna Saunders, 1900, 30th Ann. Rpt. Ent. Soc. Ontario, **1899**, p. 59, S. W. British Columbia (Mt. Cheam), *leg.* Fletcher, larvae on lupine. Nicholl, 1906, 36th Ann. Rpt. Ent. Soc. Ont., **1905**, pp. 71, 78, S. Brit. Col. (Bear L., vic. Kaslo, Kootenay distr. and Penticton, Similkameen distr.).

Rusticus anna Dyar, 1904, Proc. U. S. Ntnl. Mus., **27**, p. 787, S. Brit. Col., Kootenay distr. (Payne Mine, 3,600 ft. alt., and trail to London Hill Mine, 7000 ft. alt.).

Plebeius anna Blackmore, 1920, Proc. Ent. Soc. Brit. Columbia, syst. ser., **14**, p. 7, S. W. Brit. Col. (Hope Mts.), Pl. 1, fig. 4, male underside. Leighton, 1946, Univ. Washington Publ., Biol., **9**, p. 61, Washington (Mt. Rainier Co.; Skyline Ridge and Table Mt., Whatcom Co.; Olympic Mt., Jefferson Co.; Hart's Pass, 6,194 ft. alt. and Cooney L. Trail, Okanagan Co., and possibly three other locs.).

Plebeius scudderii ssp. ricei Cross, 1937, Pan. Pacific Ent., **13**, p. 88, Oregon (Big Cultus L., Deschutes Co.), VIII.1936, *leg.* Rice.

Lycaeides argyrognomon anna form *ricei* Nabokov, 1944, Psyche, for 1943, **50**, p. 91, Oregon (Kirk). Other forms, *l.c.*, Oregon, Brit. Col. (Vancouver Isl.), Washington (Brewster, Okanagan Co. and Yakima R.); 1945, Psyche, for 1944, **51**, p. 109, fig. 1, ARG.A., uncus, Brewster, Wash., 18.VII.1940, *leg.* Hopfinger.

Lycaeides scudderi Nabokov, 1944, *op. cit.*, pp. 93–94, Mt. Rainier form.

Plebeius scudderi race *fretchini* Chermock, 1945, Can. Ent., for 1944, **76**, p. 214, Washington (Paradise Valley, Mt. Rainier; Cooney L., Okanagan Co., Mt. Olympus, Jefferson Co.).

Specimens examined. From Oregon: transit. to *ssp. anna*, M.C.Z.; typical from Cascade Mts., Or.: males (Pl. 1, fig. 19, left; Pl. 4, fig. 35), Ft. Klamath (*ex* coll. Skinner, Ac.N.S. Phila.); female (Pl. 8, fig. 98), Crater L. (5.VIII.1913, *leg.* Engelhardt, H., *ex* A.M.N.H., M.C.Z.); female (Pl. 8, fig. 99), Kirk (same data, M.C.Z.); both sexes, Diamond L. (VII.1931, 1933, 1937, ST, A.M.N.H. and M.C.Z.). From Washington: Mt. Rainier, 5,500–7,500 ft. alt. mid VII to late VIII, 1919 (male, Pl. 1, fig. 7, Pl. 4, fig. 36), G, *ex* A.M.N.H., M.C.Z.; 1927 (female, Pl. 8, fig. 100), H, *ex* A.M.N.H., M.C.Z.; 1930 (male, Pl. 4, fig. 37; female, Pl. 8, fig. 101), *leg.* Fraser, *ex* A.M.N.H., M.C.Z.; 1937 (paratype *fretchini* Chermock), M.C.Z.; and numerous other specimens (Cornell Univ., A.M.N.H., ST and M.C.Z.). Other Washington specimens: Lone Tree, Yakima R. (30.VI.1882, M.C.Z.), Table Mt., (28.VIII.1927, *ex* Cornell Univ. M.C.Z.) and Baker Mt. (26.VII.1925, *id.*). From N. E. Wash., *leg.* Hopfinger, early VI–early IX, 1934–1939, (Brewster, ST, HC, M.C.Z., of which male, Pl. 1, fig. 20, left, Pl. 4, fig. 38; Cooney L., parat. *fretchini*, M.C.Z.; and from RR: Gold Crk., Crater L., Foggy Dew Cr., Hart's Pass, Camp Gilbert and Twisp Pass). From Brit. Col.: male (Pl. 1, fig. 21, left) and female, Peachland, Okanagan L., 30.VII.1916, *leg.* Wallis, Ac.N.S.Phila., and a pair from Coalmont, A.M.N.H. From Vancouver Isl.: male (Pl. 1, fig. 2, Pl. 4, fig. 40), and female (Pl. 8, fig. 102), *ex* Paine coll., M.C.Z.; male, 27.VI.1918, Ac.N.S.Phila.; and male (Pl. 4, fig. 39), Goldstream 9.VII.1923, *leg.* Clark, Cornell Univ.

Genitalic measurements. 5 Oregon males (Kirk; Diamond L.; Ft. Klamath) showed the range: F...35–39, H...28–37, U...27–32, E...7–11.

16 Washington males (Yakima R.; Mt. Rainier; Table Mt.; Cooney L.; Brewster) showed range: F...35–44, H...29–35, U...27–35, E...7–9.

3 Vancouver males gave: F...39–41, H...32–34, U...29–32, E...7–10.

Range for the whole subspecies: F...35–44, H...28–37, U...27–35, E...7–11.

Underside components of hindwing cell Cu_1 (in scale-lines)

Form 1. Diamond L., Or. Right hindwing of discally well-marked male: Ground (whitish)...9. Halo, prox. part...3. Macule...9. Halo, dist. part...3. Ground...0. Prox. cretule...17. Semimacule (fairly strong)...3. Aurora (weak)...3. Praet. mark (very weak, with traces of pale scintilla)...7. Term. space...8 (the whole hindwing is shortened in this specimen).

Same locality, same wing of discally poorly marked male. Ground...10. Halo, prox. part...3. Macule...1. Halo, dist. part...3. Ground...0. Prox. cretule...28. Semimacule (fairly weak)...2. Aurora (weak)...2. Praet. mark (as above)...8. Term space...11 (it is interesting to note that, as often happens in this genus, the individual with the weaker maculation has a stronger wing development than the better marked specimen).

Form 2. Mt. Rainier, Wash. Right hindwing of discally well-marked male. Ground (whitish grey)...9. Halo, prox. part...3. Macule...7. Halo, dist. part...3. Ground...0. Prox. cret...23. Semimacule (strong)...6. Aurora (fairly bright)...6. Praet. mark (fairly weak, with good scintilla)...9. Term. space...9.

Same locality, discally poorly marked male. Ground and halo as above. Macule...5. Prox. cretule...27. Semimacule (strong)...3. Aurora (fairly bright)...5. Praet. mark (replaced by a few pale scintillant scales...5. Term. space...12 (length partly due to obsolescence of praet. mark pigment).

Form 3. Okanagan Co., Wash. Right hindwing of discally well-marked male from Brewster. Ground (white-grey with pale fawn cast)...8. Halo, prox. part...3. Macule...6. Halo, dist. part...3. Ground...0. Prox. cretule...24. Semimacule (weak)...3. Aurora (bright)...8. Praet. mark (rather weak with good scintilla)...8. Term space...8.

Same wing of discally poorly marked male from Cooney L. Ground (whitish grey)...13. Halo, prox. part...3. Macule...2. Halo, dist. part...3. Ground...0. Prox. cretule...26. Semimacule (weak)...4. Aurora (very weak)...3. Praet. mark (merely adumbrated, no scintilla)...9. Term space...9.

Form 4. Vancouver Isl., B. C. Right hindwing of male. Ground (whitish grey)...18. Halo, prox. part...3. Macule...6. Halo, dist. part...3. Ground...4. Prox. cretule...18. Semimacule...5. Aurora (rather weak) ...6. Praet. mark (fairly strong, with large scintilla)...11. Term. space...9.

Throughout a large area comprising the Cascade range (Oregon, Washington), the northern part of Washington and several localities in southern British Columbia, we witness at certain points the little-studied phenomenon of the production of similar (in the present case limbally immaculate) undersides by means of the fading out of the pattern of dissimilar basic forms of *argyrognomon*, each of which is linked up with a different subspecies. The butterfly fauna of the regions involved is so poorly known (despite "check-lists") that for the moment I prefer grouping several forms under one subspecific heading (*ricei*).

A series marked "Oregon" (and sold to Weeks as "*annetta*") is still so close to *ssp. anna* that it might be assigned to either subspecies. Little remains of the underside limbal markings, save the thin semimacules, and the upperside aurorae in the female are reduced, but the

general aspect of the specimens, owing to the well-developed wing-shape is still *anna*-like.

Ft. Klamath and Diamond Lake undersides, which are nearest to typical *ricei*, show every transition from what looks like poorly marked *anna* to specimens indistinguishable from Mt. Rainier ones. The whole system I (limbal) followed by macules II (discal) is liable to disappear in hw. (but both sets are more stubborn in fw.). The fw. length dwindles to an average of 13 mm., and the discal set in fw. is on the whole less sinuous. The Kirk female is small and except for a few dull scales in the strong cells of hw., devoid of upperside aurorae. Although the corresponding male, which is also small, has regained the underside limbal system of hw., it has not acquired an "*anna*" aspect but a definite "*scudderi*" look.

In the Rainier region, the starting point, or spring board, for the gradual fading out of the underside hw. markings, is a form (occurring among immaculate individuals but probably racially predominant elsewhere in Wash.) which approaches the Vancouver Isl. race in four characters: 1. extension of turquoise pulvis (basal in fw., well over the disc in hw.); 2. slight elongation of fw. discal macules; 3. fair development of unconnected, or weakly connected, light colored aurorae in hw., and 4. distinctly marked semimacules tending to a pointed shape. From small Californian and Oregon (*anna, prox.*) specimens it differs in a greater amount of pulvis and in the components of the limbal set being less conspicuously spaced. *Ssp. scudderi* undersides look either drabber (in greyish or greyish fawn specimens with reduced pulvis) or whiter (in poorly pigmented forms) and have much heavier proximal triangles even when the other markings are weak.

The Rainier female is a small, comparatively short-winged edition of *ssp. anna*, quite similar to certain Oregon specimens, with the underside ground varying from "dead leaf" (Edwards' term) to white, exactly as in that subspecies. The upperside aurorae are of a dull weak yellowish tint with blurred outlines. They disappear in specimens roughly corresponding to the fade-out males.

In the fade-out underside aspect of the Rainier form the weak pigment of the praeterminal marks seems to be the most liable to go, and in such specimens (with or without the pale scintillae in hw. which may linger after the pigment has vanished) the retention in both wings of well-marked semimacules rimming proximally the narrow aurorae give an interesting supercilious appearance to the limbal part of the wing. At a further stage the semimacules have disintegrated leaving

more or less distinct, naked-looking aurorae. When these go, and when the fairly stubborn scintillae follow suit, nothing remains of the limbal markings in either wing save vague traces of proximal cretules and a faint terminal line with or without weak inner triangles. All this hardly affects the fw. discal macules, although there do occur specimens with these macules reduced (to about 1/35) and the colon obsolescent. In the hw., on the other hand, the disappearance of some or most of the discal macules is fairly usual but does not necessarily coincide with the limbal fading. When this does coincide we get the almost immaculate whitish hw. of the extreme form (the "race *fretchini*" of Chermock). Incidentally, the first Mt. Rainier specimens of this form were collected not by Frechin, but by McDunnough in the summer of 1910, above Paradise Valley at an elevation of about 7,000 ft. on an isolated stone ridge jutting over a snowfield.

From Okanagan Co., N. E. Washington, come undersides, of which some are similar to the fade out aspect of the preceding form. The wings, however, seem to tend to a more elongated shape with a higher angle to the hw. In the females, which are larger than the Mt. Rainier ones, the upperside aurorae are somewhat better developed, especially in hw., and are of a warmer shade (approaching in this and in "long" wing shape the Didsbury form of *ssp. ferniensis emend.*). In one of these females (*ex* ST, M.C.Z.) both proximal (short arrowhead) cretule and distal (bar-like) cretule are reproduced on the upperside of the hw. in chalky blue. There is also a tendency to the spreading of some basal blue. The basic aspect of the male underside corresponding to the basic aspect of the Mt. Rainier form, curiously differs from the latter. The ground is dustier with a fawn shade; the cretules are indistinct; partly owing to the blurriness of their haloes the distal macules seem rather weak; but in contrast to the weak semimacules (quite different from those in strong specimens of the Mt. Rainier form) the aurorae though small and unconnected are vividly colored, and the praet. marks as well as the prox. triangles are more distinct than in other Washington specimens. The general effect combined with the "long" wing shape and the strong vadum of the upperside suggests a possible intergradation further east with *ssp. ferniensis.*

Two poorly-marked specimens from the Similkameen district, S. Brit. Col. (Peachland, on Okanogan L., and Coalmont between Okanagan L. and Fraser R.) seem connected with *ssp. scudderi* of the Osoyoos region and central B. C. More material, however, is needed for a fuller analysis.

Under the subspecific heading *ricei* I also place (provisionally) the

beautiful and very curious Vancouver Island race, to which presumably Fletcher, 1904 and 1906, refers in the 34th and 36th Ann. Rpts. Ent. Soc. Ontario, **1903**, p. 91, and **1905**, p. 80, saying that "*Rusticus anna*" is not uncommon on Vancouver Isl. and was taken near Wellington by Tailor. Males 14–15 mm., female 14 mm. Male underside characters: 1. weak greyish ground thoroughly dusted with turquoise blue, the brightness and discal extension of the pulvis being especially conspicuous in hw.; 2. the singular tendency on the part of the fw. discal macules to assume a triangular (basad pointing) shape, this tendency being repeated in the semimacules of both wings; 3. the equally singular arrangement of the discal macules of fw. in a straight row parallel to the limbal series and much closer to the latter than to the discoidal; this is a well known individual extreme in many races and if found to be racially permanent here would be of great interest; 4. the palish, narrow, more or less connected aurorae, the fw. ones being only slightly weaker than the hw. set.

The female, a poor specimen, resembles some of the Wash. specimens on the upperside. The aurorae are difficult to make out in fw.; those in hw. are narrow and, together with the strong insulae, of a conspicuously pointed shape. There is a good deal of bright blue despite the state of the specimen, and in the strong cells the pointed prox. cretules are repeated in blue. The underside is very like that of the male.

Lycaeides argyrognomon lotis (Lintner)

Pl. 1, fig. 18, left; Pl. 4, figs. 41–43; Pl. 8, figs. 107, 108.

Lycaena lotis Lintner, 1878, 30th Rpt. N. Y. State Mus. Nat. Hist., **1876**, p. 169. Mendocino, N. W. Calif.

Plebeius melissa form *lotis* McDunnough (*pro parte*), 1916, Barnes and McDunnough, Contrib. Lep. N. Amer., **3**, p. 111, lines 12–13, male, Hy. Edw. Coll. (labeled "Mendocino").

Lycaeides scudderi lotis Nabokov (*sensu stricto*), 1944, Psyche, for 1943, **50**, pp. 94–95, same specimen as above.

Lycaeides argyrognomon anna Nabokov, 1944, *ibid.*, p. 91, Mendocino Co. (Pt. Arena), male and female.

This butterfly has been badly confused with *melissa inyoensis* (Gunder) *emend.*, *q.v.* To the scraps of information about it one may add that the types may have been collected by Hy. Edwards; that Holland (1900, Ent. News, **11**, p. 416), possibly thinking of *lotis* Wright (*anna* Edw. *prox.*), suggests the Mt. Shasta region as the true

type locality; and that Butler (1882, J. Linn. Soc., **16**, p. 469) refers to a female of "*Lycaena anna*", taken in Mendocino Co. by Walsingham, which ought to be checked, if it exists in the Brit. Mus. Since my fixation of the true *lotis* in 1944, as separate from the Californian subspecies of *melissa*, no other specimens of the typical form of *lotis* have come to light. Darkest Africa seems to be better known lepidopterologically than the coastal stretch of Western North America from Mendocino northwards. In consequence of a reexamination of the Pt. Arena pair, I now assign it (as form 2) to this subspecies.

Specimens examined. Form 1. Mendocino, Calif. One male (Pl. 1, fig. 17, left; Pl. 4, fig. 41), *ex* coll. Hy. Edwards (No. 6139), A.M.N.H., and female (Pl. 4, fig. 43, Pl. 8, fig. 108), photograph of type (labeled "L. Lota Lintn., 5668"), *ex* coll. Edwards (W. H.), coll. Lintner, New York State Mus.

Form 2. Pt. Arena, Mendocino Co., Calif. Male (Pl. 4, fig. 42) and female (Pl. 8, fig. 107), *leg.* Guedet, 12.VII.1933, from ST, the male donated to M.C.Z.

Genitalic measurements. Form 1: F...37. H...31. U...33. E...6. Form 2: F...44. H...36. U...36. E...8.

Underside components of hindwing cell Cu_1 (in scale-lines)

Form 1, right hindwing of male. Ground (pale greyish)...8. Halo, prox. part...4. Macule (fairly strong)...7. Halo, dist. part...4. Ground...0. Prox. cretule...19. Semimacule (strong, except the first three scale-lines which form the weakly pigmented but otherwise sharp apex)...8. Aurora (fairly bright, with cusps reaching the prox. triangles)...6. Praet. mark (strong, with scintilla forming an inner circle)...12. Term. space...8. Term. line...2 (rising to 7 on veins).

Form 2, right hindwing of male. Ground (strong greyish fawn)...13. Halo, prox. part...4. Macule (fairly strong)...9. Halo, dist. part...3. Ground ...0. Prox. cretule...17. Semimacule (as above)...12. Aurora (as above) ...7. Praet. mark (fairly strong with patchy scintilla)...12. Term. space...8. Term. line...2 (rising to 10 on veins).

Form 1. Fw. length: male 12.5, female 15 mm. There can be no doubt whatever that the male I figure belongs to the same form as the female type. It is exceedingly close to Lintner's description from which it differs only in being smaller ("male 1.30 inch from tip to tip" o.d.), and in having a semblance of fw. aurorae thinly (i.e. reaching the praet. mark only in Cu_1) rimming the semimacules, whereas Lintner notes that "the two rows of the submarginal series are . . . without (sufficient?) space between them for the fulvous (misprinted "fuscous"

in the text) spots (i.e. the aurorae) usually present, at least in the median portion of the range, in the male of *scudderii* (i.e. *melissa samuelis*, to which Lintner under the name of "*scudderii*" is comparing his new form). The underside ground is pale greyish ("greyish," o.d.), with pulvis about as much developed as in *anna*. The size of the discal macules is about average in hw. but just a little below that in fw. (so that the contrast common in *anna* between average fw. macules and reduced hw. ones is absent here). Macule Cu_1 in fw. happens to be elongated. Owing to the shortness of the fw., the specimen looks somewhat stubby. The space between discal and limbal series is narrower (compared to the space between discoidal and discal) than in average *anna*, and the fw. interval I is narrower than in sympatric *melissa*. The semimacules and praet. marks of fw. are well defined ("nearly equally well defined" as in *samuelis*, o.d.) and so are the prox. cretules and inner triangles. The hindwing components of system I are also well defined, with the triangular prox. cretules well in evidence. The aurorae ("a connected series of fulvous crescents tending to a sagittate form, narrowly edged before with black," o.d.) are comparatively well developed, with cusps reaching the conspicuous proximal triangles ("at the tips of the veins a row of subtriangular black spots, o.d."). The semimacules are thin and pointed. The praet. marks are well provided with turquoise scintillae ("the black spots of the submarginal series are nearly covered with metallic scales giving a green reflection," o.d.).

On the upperside the rather strong vadum is sharply defined ("margins bordered with black, extending narrowly on the costa to near the base," o.d.) in both wings, with conspicuous terminal vadosae ("veins defined by black scales") and the vadosal fringe is weakly checquered with outer triangles in hw. ("black basilar scales," o.d.).

From *anna* the underside differs in the development of the aurorae and in several other characters already noted. From certain Idaho and Montana individuals it differs only in the comparatively conspicuous spread of light blue pulvis peculiar to the west coast races. I should not be surprised to find intergrades along the coast between *lotis* and the Vancouver race.

The female type, which I know only from a photograph (not very clearly reproduced, figs. 43 and 108) has on the upperside rather narrow ("crescentiform," o.d.) aurorae in fw. (these did not come out in the reproduction) and hw., with the ("semielliptical," o.d.) insulae larger than in *anna* (in correspondence, of course to the development of the underside praeterminal marks). Lintner notes "a few, perhaps

twenty on each side, purple scales . . . beneath the basilar portion of the median [Cu] of the primaries and at the base of the secondaries." He also discerned, in his admirable description, so greatly superior to Edwards' descriptions of Lycaenids, the distal cretules reproduced on the upperside by "a few pale scales." The upperside can be matched by individuals from Brit. Col. but the specimen seems more robust. The underside is more heavily marked than in the male (though, curiously enough, this coincides in the specimen with the obsolescence or at least extreme reduction, of macules Cu_2III and 4A). The semimacules are more distinctly pointed than in the male.

Form 2. The fw. in the male is almost 17 mm. long, though actually underdeveloped in comparison to the enormous high angled hw. Excluding *anna*, it is the largest American specimen of *Lycaeides* known to me, and Stallings when sending it commented on its extraordinary "palearctic" appearance. The underside is of a rather dark greyish fawn with the bluish green pulvis fairly well developed, with, in both wings, strong discal macules well above average, dull haloes, dullish, narrow, tapering cretules, strong pointed semimacules and well-developed but not very bright aurorae. In spite of the greater size and stronger pigmentation, it belongs, I believe, to the same ssp. as form 1 and this is confirmed by the appearance of the female (15 mm.) which is very similar to the photograph of the type, the only difference being the slightly more extended aurorae above and the straighter row of discal macules in fw. below. The fringes are well infuscated. The hindwing is more strongly angled and the hw. aurorae less neat looking than in the "dark" (Sequoia) *anna* which it somewhat resembles.

Lycaeides argyrognomon alaskensis (F. H. Chermock)

Pl. 1, fig. 3; Pl. 5, figs. 51, 52, 55; Pl. 8, figs. 112, 115.

Lycaena shasta Fletcher, 1889, Rpt. Geol. Surv. Canada, **3**, part B, p. 230, Yukon Territory (Upper Pelly R. and Lewes R.), 3.VIII.1887, *leg.* Dawson.

Lycaena lotis Holland, 1900, Ent. News, **11**, p. 416, E. Alaska (Eagle City). Winn, 1912, Can. Ent., **44**, p. 215, W. Yukon (vic. Dawson City).

Lycaena kodiak Wright, 1906, Butt. W. Coast, p. 221, S. Alaska (in canyon above Juneau), 10.VI.1891, *leg.* Wright; figs. 365, b, c, both sexes, female underside.

Rusticus anna Fletcher and Gibson, 1908, 38th Rpt. Ent. Soc. Ontario, **1907**, p. 119, Yukon (Pelly R. below Hoole R.), 5.VII.1905, *leg.* Keele.

Rusticus scudderi, prox., Anderson (and McDunnough), 1915, Proc. Ent. Soc. Brit. Col., **1915**, p. 126, N. British Columbia, Atlin district (common at Wilson Cr., VI, and Hot Springs) [*trans. ad ssp. scudderi.*]

Plebeius scudderi McDunnough, 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, p. 110, Atlin (*V. supra*). Blackmore, 1920, Proc. Ent. Soc. Brit. Columbia, Syst. series, 14, p. 7, Atlin, Pl. 1, fig. 2, male underside [*trans. ad ssp. scudderi*]. Gibson, 1920, Rpt. Can. Arct. Exp., **3**, p. 28, Yukon (adds: Lansing R., 24.VI.1905, *leg.* Keele; Wagon Rd., 9 mi. from Whitehouse, 7.VII.1908, *leg.* Stewart; Stewart R., 17.-VII.1905, Keele); Pl. 3, fig. 15, male underside, from W. side of L. Kluane, near Jacquot's roadhouse.

Plebeius kodiak McDunnough, 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, p. 111.

Lycaena scudderi race *kodiak* Holland (*pro parte*), 1931, Butt. Bk. rev. edit., p. 263, Pl. 66, fig. 14, female (label, according to Chermock, 1945, *q.v.* "Ramparts, Alaska, 10.VI.1916"). Cadbury, 1938, Proc. Acad. Nat. Sci. Philadelphia, **89**, pp. 411–412, N. E. Brit. Col. (Halfway R., 10 mi. W. of Westergard's Cabin, 3,500 ft. alt., 22.VII; Pink Mt. Base, 2,850 ft. alt.; Pink Mt., 4,500 ft. alt., 20.VII.), *leg.* Henry; Pl. 16, fig. 10, male both sides (Halfway R.), fig. 11, female both sides (Pink Mt.), both *trans. ad. ssp. scudderi; l.c.*, mentions specimens from Circle, Alaska.

Plebejus scudderii races *kodiak* and *aster, prox.*, Leussler, 1935, Bull. Brooklyn Ent. Soc., **30**, p. 58, N. W. Mackenzie (50 mi. N. E. of Aklavic), 9.VIII.-1930, females.

Lycaeides argyrognomon trans. ad. scudderi Nabokov, 1944, Psyche for 1943, **50**, p. 91, Alaska (McKinley).

Lycaeides scudderi scudderi Nabokov (*pro parte*), 1944, *op. cit.*, p. 93, Atlin, B. C. and Yukon (Whitehorse and Mayo).

Plebeius scudderi race *kodiak* Chermock, 1945, Can. Ent., for 1944, **76**, p. 213, "coastal race."

Plebeius scudderi race *alaskensis* Chermock, *l.c.*, Alaska (Ft. Yukon, 27.VI.1916, *leg.* Kusche, holotype; Ramparts, female figured by Holland, 1931, allotype; Eagle City; Fairbanks; College; Circle), Yukon (Dawson and Whitehorse).

It is interesting to note that the first specimens were referred to what is now known as *Icaricia shasta* (Edwards). There does exist a curious homoptic resemblance between the two. The name used by Wright, 1906, who assigned it to Edwards (*op. cit.*, p. 63), is preoccupied by *Lycaena kodiak* Edwards (1879, Trans. Amer. Ent. Soc., **3**, p. 20), which judging by the description seems to be a form of *Icaricia icarioides* (Boisduval).

Specimens examined. From Alaska: specimens from Circle (male paratype, CM, Pl. 5, fig. 52), Fort Yukon (female paratype, M.C.Z.,

Pl. 8, fig. 115), Skagway (VII.1923, *leg.* Shoemaker, H, A.M.N.H.), Fairbanks (I.VII.1923, male paratype, CM) and McKinley Park, *leg.* Fraser VII–VIII, 1930 (of which series see males, Pl. 1, fig. 3, and Pl. 5, fig. 51, *ex* A.M.N.H., M.C.Z.). From Yukon: specimens from Whitehorse (5.VII.1930, *leg.* Fraser, M.C.Z.), N. of Mayo (5.VII.1942, ST), between Whitehorse and Dawson (7.VII.1908, *leg.* Stewart, Ac.N.S.Phila.) and above Teslin, mile 56 of Military Highway (female, 19.VIII.1943, *leg.* Correll, M.C.Z. From Atlin, N. Brit. Col. (of which see male, Pl. 5, fig. 55, and female, Pl. 8, fig. 112, *leg.* Fraser, *ex* A.M.-N.H., M.C.Z.).

Genitalic measurements. 14 males from Alaska (McKinley; Circle; Skagway) and Yukon (Whitehorse) showed the range: F...37.5–42.5, H...29–36, U...27–32, E...6–9. It can be safely predicted that when the north Siberian form of the species is discovered, it will be found to be intermediate in F between this and *ssp. lapponica* (Gerhard) of which a specimen I have from Abisko measures F...33.5, H...30. U...28, E...6.5

Underside components of hindwing cell Cu_1 (in scale-lines)

Left hindwing of well-marked male (paratype) from Circle, Alaska. Ground (greyish fawn)...7. Halo, prox. part...3. Macule (strong)...8. Halo, dist. part...3. Ground...0. Prox. cretule...22. Semimacule (rather weak)...7. Aurora (rather dull, with thin neural cusps)...4. Praet. mark (fairly strong, with dull scintilla)...12. Term. space (blurrily pigmented)...7. Term. line...1 (rising weakly to 5 on veins).

Right hindwing of poorly marked male from same locality. Ground (as above)...10. Halo, prox. part...4. Macule (rather weak)...5. Halo, dist. part...3. Ground...8. Prox. cretule...19. Semimacule (weak)...3. Aurora (weak, dull, no cusps)...5. Praet. mark (blurred, with weak scintilla) ...10. Term. space (as above)...3. Term. line...2 (rising to 4 on veins).

The original description refers to poorly marked individuals. Actually specimens with greatly reduced macules occur together with strongly marked ones. Indeed in one of Chermock's paratypes (1004, M.C.Z.) from Circle, Alaska, the discal macules attain 1/18 in fw. and 1/15 in hindwing which is enormous for the nearctic branch of the species. On the whole a series from Mt. McKinley, Al., not mentioned in the o.d., gives the best idea of what *argyrognomon* tends to look like in the N. W. of America. I would formulate the appearance of the male underside of *alaskensis, emend.* as: the combination of a wide variational scope in the macules (from greatly reduced to overdeveloped) on an equally variable ground (from light greyish fawn to

dull darkish fawn) with the following two, more or less marked, tendencies (sometimes both occurring in the same individual): 1. reduction of the white element (blurred haloes, small or dull cretules) and 2. the blurring of all or some elements of the limbal set (dingy aurorae, for instance). This is not a very satisfactory segregation of underside characters, but the female upperside is more peculiar and (unless the unknown *ssp. scudderi* from the type locality eventually turns out to be identical with it, which I doubt) warrants the creation of a subspecific group separate from *ssp. scudderi.* The more or less sparse "blue" structural scales on the deep fuscous ground of both wings reach the submarginal limit and in the hindwing even invade the subcostal region (not a usual occurrence in *Lycaeides*); they are generously intermixed with much paler (light turquoise, whitish, semitransparent) structural scales quite similar to those which in ordinary "blue" females (*viz.* from Manitoba) clothe the forewing subcosta or line some of the veins or reproduce the cretules. To the naked eye the wings produce the effect of being powdered with more or less light greyish blue (the impressionistic O.D. has "suffused with greyish brown," the "brown" being surely borrowed from the ground). In extreme specimens (one Ft. Yukon, one McKinley) the triangulate accumulation of such scales in each cell limbally to form whitish grey or whitish blue proximal cretules in the hindwing is a very marked feature (cp. *melissa annetta*), and combined with: 1. the dusty looking, greyish blue, more or less expanded overlay; 2. the very blurred (intermixed with fuscous scales) small aurorae, only present in hindwing, and 3. the obsolescence of limbal markings in the forewing, produces an interesting effect.

In specimens from Atlin, B. C., the females are typically *alaskensis* whereas the male underside is quite similar to Western Alberta (especially Laggan) specimens of ssp. *scudderi.*

Lycaeides argyrognomon scudderi (Edwards)

Pl. 1, figs. 4, 5, 23, left; Pl. 5, figs. 53, 54, 56, 57, 59;

Pl. 8, figs. 111, 113, 114, 116.

Lycaena scudderii Edwards (*pro parte*), 1861, Proc. Acad. Nat. Sci. Philadelphia, **1861**, p. 164, male only [the female, *l.c.*, obviously belongs to *Agriades glandon aquilo* (Boisduval), see Nabokov, 1944], "Lake Winnipeg" (more exactly: mouth of the Saskatchewan R., betw. Cedar L. and the Pas, W. Manitoba, on spruce-treed north bank, early VII.1860; sec

Scudder, 1886, Winnipeg Country, p. 56, and Scudder, 1889, 1901, *q.v.*). Edwards (*pro parte*), 1863, *ibid.*, **1862**, p. 225, Fort Simpson, Mackenzie R., S. Mackenzie, *leg.* Ross (the description of the female, from London, Ont., refers to *Lycaeides melissa samuelis* Nabokov). Strecker (*pro parte*), 1874, Lep., p. 87, British Columbia. Bethune (*pro parte*), 1894, 25th Ann. Rpt. Ent. Soc. Ontario, **1894**, p. 37, W. Ontario (Nipigon). Scudder (*pro parte*), 1901, Ottawa Nat., **15**, p. 121. Dodd, 1908, Can. Ent. **40**, p. 192, W. Alberta ("a few females at Laggan near the station," 18.VII.-1904). Whitehouse, 1918, *ibid*, **50**, p. 2, W. Alb. (spruce-treed, shaly slopes of Coliseum Mt., vic. Nordegg). McDunnough, 1927, *ibid.*, **59**, p. 161, S. W. Brit. Col. (Mt. McLean, Seton L. region, 4,000–5,000 ft. alt. in open meadows, 10–13.VII.1926).

Cupido scudderi Kirby, 1871, Syn. Cat. Diurn. Lep., p. 358. Butler, 1901, Ent., **33**, p. 124.

Plebeius scudderi Kirby, 1877, *op. cit.*, Suppl., p. 766. Butler, 1893, Annls. and Mag. Nat. Hist., **12**, p. 13, Mackenzie R., east bank, 30 mi. N. of Arctic Circle, *leg.* Taylor, 18.VII.1892. McDunnough (*pro parte*) 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, p. 110, Nipigon, W. Ontario. Brodie, 1929, Trans. R. Can. Inst., **27**, p. 84, S. Manitoba (Victoria Beach). Freeman, 1938, Can. Ent., **70**, p. 63, W. Ont. (Minaki) and S. E. Manit. (Sandilands). Rysgaard, 1939, Ent. News, **50**, p. 193, E. Minnesota (northern part of Pine Co., loose brush area, late VI.1938.) Macy and Shepard (*pro parte*), 1941, Butterflies, pp. 171–172, N. E. Minn., West of L. Superior (Tower; Lake McFarland, settling with *Plebejus saepiolus* on damp ground) and Centr. Minn. (Ottertail Co.; recorded by Leussler on road between Pequot and Pelican L.). Brooks, 1942, Can. Ent., **74**, p. 35, Manitoba (Norway House; north end of Winnipeg L., *leg.* Brown; The Pas, West of Winnipeg L. [material untraceable]).

Rusticus scudderii Scudder (*pro parte*), 1877, Bull. Buffalo Soc. Nat. Sci., **3**, p. 122, adds S. Labrador (probably closer to *ssp. aster*); 1889, Butt. New England, **2**, pp. 964, 967, adds S. Hudson Bay (Charlton Isl., *leg.* Macoun teste Fletcher) and Lake Lahache, B. C. (teste Edwards).

Lycaena scudderi race *kodiak* Holland (*pro parte*), 1931, Butt. Bk., rev. edit., pl. 66, fig. 15, male underside (labeled "Fairchild Point, Great Slave L., 22.VII.1927", *fide* Chermock, 1945).

Lycaeides scudderi Stempffer, 1933, Bull. Soc. Ent. France, **38**, p. 110–112, text fig. 1, male genit., S. Brit. Col. (Rutland, Okanagan L.). Nabokov, 1944, Psyche, **50**, pp. 87–89, 92–93, Saskatchewan R. (more exactly: between Winnipeg L. and Cumberland House, VII.1859; for Kennicott's travels see 1869, Trans. Chicago Acad. Sci., **1**, p. 163), *leg.* Kennicott, "neotype"; other stations: W. Sask. (Harlan); Minn. (Pequot; Arrowhead Trail); E. Brit. Col. (Hefferly Cr.); W. Alberta (Foothills; Jasper; Banff [*trans. ad ssp. ferniensis q.v.*]); 1945, Psyche, **51**, pp. 109–111, fig. 1, SCU, uncus of Kennicott's specimen, *v. supra.*

Lycaeides argyrognomon Nabokov (*pro parte*), 1944, Psyche, for 1943, **50**, p. 91, Laggan, Alberta.

Plebeius scudderii race *subarcticus* F. H. Chermock, 1945, Can. Ent., for 1944, **76**, p. 213, Great Slave L. (male paratype figured by Holland, 1931, *q.v.*).

I have had to omit a few references which were quite impossible to unravel without seeing the specimens. It may well be, for instance, that a well-marked Washington form near *ssp. scudderi* is disguised as "*Plebeius melissa* var *lotis*" in Leighton's incredibly naive paper (1946, Univ. Washington publ., Biol., **9**, p. 61), where utter confusion is achieved by references, under each item, to Holland's hopelessly unreliable book. In this connection, it is worthwhile repeating that Holland, 1931, figured, as the "type" of *Lycaena scudderi* Edwards, a male of *melissa samuelis* Nabokov (see Psyche **50**, p. 98, footnote), which is one of the reasons why I do not attach any importance to Chermock's vague statement (1945, Can. Ent., for 1944, **76**, p. 213) that in Edwards' Collection (Carnegie Mus.) he found "two males . . . that may be part of the series given to Edwards by Scudder." The confusion between *argyrognomon scudderi* and *melissa samuelis* runs through the whole literature, and from Scudder, 1898, to Macy and Shepard, 1941, biological data referring to *samuelis*, are assigned to *scudderi*. A crucial date is that of Stempffer's (1933) fixation of the genitalic position of *scudderi*. His specimen presumably belonged to the rather well-marked B.C. form which grades into *ssp. ferniensis* eastward and into *ssp. ricei* westward.

Specimens examined. Male (Pl. 1, fig. 5, Pl. 5, fig. 57), Saskatchewan R., *leg.* Kennicott, M.C.Z. From S. Manitoba: specimens from McCreary (of these female, Pl. 8, fig. 14, *ex* A.M.N.H., M.C.Z.). Beulah (*ex* HC, M.C.Z.) and Riding Mts. (of these two males, Pl. 1, fig. 23, Pl. 5, fig. 59, *ex* ST, M.C.Z.). From Minnesota: male, female (Pl. 8, fig. 114), Arrowhead Trail, Cook Co., 17–19.VII.1940, *leg.* Macy, *ex* ST, M.C.Z., and male (Pl. 5, fig. 54), Pequot, Crow Wing Co., 23.VI.1919, *leg.* Wolcott, H, *ex* A.M.N.H., M.C.Z. From Alberta: male (Pl. 1, fig. 4), Laggan, 6.VIII.1890, M.C.Z.; female (Pl. 8, fig. 113), Laggan, 4,900–5,100 ft. alt., early VII, *leg.* Bean, M.C.Z.; male (Pl. 5, fig. 56), Tonquin Vy., Jasper Ntnl. Prk., 20.VIII.1932, *leg.* Gregson, M.C.Z. Other Alberta specimens: Baker L., L. Louise, Mt. O'Brien, Mt. Park, Ptarmigan Vy., Cascade Vy. and Banff. From British Columbia: specimens from Jesmond (of which female, Pl. 8, fig. 111, VII. 1937, *leg.* Jacob, CM), Hefferley Cr., Carbonate, New Westminster, Quesnel, Rolla, St. Mary's L., Stanley and Kelowna.

From Mackenzie: male (Pl. 5, fig. 53), female, S. shore of Great Slave L., VI–VII.1927, *leg.* Bedford, *ex* CM, M.C.Z. (paratypes of *subarcticus* Chermock).

Genitalic measurements. 30 males (Arrowhead and Pequot, Minn.; Riding Mts., McCreary, Beulah and Sask. R., Manit.; Tonquin Vy., Mt. Park, Laggan, L. Louise, Mt. O'Brien and Banff, Alberta; Jesmond, Hefferley Cr., Carbonate, Quesnel and New Westminster, B. C.) showed the range: F...38–48, H...30–36, U...29–38, E...6.5–9.

Underside components of hindwing cell Cu_1 (in scale-lines)

Saskatchewan R., right hindwing. Ground (grey)...12. Halo, prox. part ...3. Macule (fairly weak)...4. Halo, dist. part...3. Ground...0. Prox. cretule...32. Semimacule (fairly strong)...7. Aurora (fairly bright, no cusps)...4. Praet. mark (rather weak, with well developed scintilla proximally)...8. Term. space...8. Term. line...1 (rising to 5 on veins).

Riding Mts., Manit., right hindwing. Ground (whitish)...8. Halo, prox. part...3. Macule (very strong)...14. Halo, dist. part...3. Ground...0. Prox. cretule...20. Semimacule (very strong distally)...10. Aurora (fairly bright, no cusps)...7. Praet. mark (fairly strong, rimmed with scintilla)...11. Term. space...7. Term. line...1 (rising to 4 on veins).

Jasper Ntnl. Prk., Alberta. Right hindwing. Ground (greyish fawn)...4. Halo, prox. part...3. Macule (fairly strong)...7. Halo, dist. part...3. Ground...23. Prox. cretule...8. Semimacule (rather weak)...5. Aurora (fairly bright, no cusps)...6. Praet. mark (fairly strong, with central scintilla)...7. Term. space...7. Term. line...1 (rising to 4 on veins).

From Alaska southwards and eastwards *alaskensis* imperceptibly turns into *scudderi*, the delicate underside maculation becoming clear on a greyish or whitish ground and the female upperside becoming of a brighter blue with more or less developed aurorae. Typical *scudderi* occurs from Alberta through Canada as far as Labrador and Eastern Quebec, where it integrades with *aster*. Neither *scudderi* nor any other form of *argyrognomon* occurs in the Eastern States. In the Middle West it is only known from Minnesota. In British Columbia the female of *scudderi* loses its blue overlay (and finally its aurorae), and both sexes show intergradation with *rieei* or *ferniensis*. With the latter *scudderi* also intergrades in S. W. Alberta.

I have already described Kennicott's specimen (Psyche **50**; 93), which is the only topotype known to me. A few details may be added. Fw. length 14 mm. The elongated proximal cretules which fuse with the discal haloes in both wings are very clear on the greyish ground

of the underside. The macules are of almost average size (1/20) in fw. (where the mean of the M ones is 9 sls) and somewhat reduced (1/27) in hw. (mean of M only 5). Macule Cu_1 of forewing happens to be elongated (17 sls) as it was in Edwards' lost type. The narrow (8 sls in Cu , dwindling to 4 in M_1) intervals I in fw. carry proximally a costad fading set of faint aurorae, which are attached to blurred but fairly developed semimacules and do not reach distally the weak praeterminal marks. The narrow (4 sls in Cu_1) aurorae of hw. are rimmed distally with scintillant scales; these look very light owing to the weakness of the bar-shaped praeterminal marks which they overlap proximad. The semimacules are weakly crescentic in the strong cells but tend to a bar-shape costad. The well-marked inner triangles are of fair size in hw., but the outer ones are quite weak.

In specimens from S. Manitoba, the underside ground ranges from the greyish of the typical form with which it intergrades, to a smooth *anna*-like powdery white. The macules and semimacules tend to be considerably stronger than in the typical form. As in the latter, the scintilla proximally tends to intrude by means of a few separate scales upon the fulvous of the narrow aurora without any of the praeterminal mark pigment showing between, thus producing a melting effect found also in subspecies *anna*, subspecies *ricei* and in *melissa annetta* specimens.

The female of the S. Man. form attains 15 mm. Its lightish violet-blue overlay may reach the limbal area. In the fw. the upperside semimacules and praeterminal marks merge with the dark fuscous ground always represented limbally as a more or less distinct border which is either devoid of aurorae or bears some traces of it. There is a RM insula. The outer fringe of both wings is unpigmented. In the hindwing the blue covers most of the wing from M_1 dorsad. The semimacules are either weakly adumbrated or quite absent while the aurorae are sometimes fairly clear throughout or represented only in the strong interspaces.

Very close to the preceding in maculation and size is some very interesting but scanty (and, in the case of the Cook Co. pair, badly battered) material from Minnesota. The underside is somewhat less dusted with white, thus being of a pale dingy fawn occurring also in the Western forms.

From the Rocky Mts. of Western Alberta I have a smallish (about 13 mm.) form which except for a slightly darker, dull-greyish fawn shade below and shorter cretules in both wings is like the typical race. The greenish-blue pulvis is well developed in the hw. The two females

I have differ from the McCreary ones in smaller size, somewhat yellower aurorae in hw. and a lesser expanse of blue overlay which becomes very weak and sparse in the Laggan specimen.

Specimens (two somewhat battered paratypes of "*subarcticus*") from the South shore of Great Slave Lake are quite similar in the male underside to well-marked undersides of *alaskensis*, while the female upperside has (as much as can be made out) little to distinguish it from *ssp. scudderi* from S. Manitoba. The underside described by Chermock as "heavily suffused with black scales" merely shows sparse whitish blue and whitish fawn scales overlaying (with a good deal of dark gaps due to the poor condition of the specimens) the deep fawn ground, and this effect occurs in many specimens of *alaskensis* and *scudderi*, especially if worn.

Lycaeides argyrognomon aster (Edwards)

Pl. 1, figs. 6, 7, 8; Pl. 5, figs. 60–62; Pl. 8, figs. 117–118.

Lycaena scudderi, 1868, Couper, Can. Ent., **1**, Pl. 67, coast of Labrador (little Watchsheshoo Harbor, 1.VI); 1872, *ibid.*, **4**, p. 205, E. Quebec (N. shore of Gulf of St. Lawrence, opposite Mingan Isl.), Anticosti Isl. (Fox Bay), 18.VI–1.VIII. Möschler (*pro parte*), 1874, Stettin Ent. Ztg., **35**, pp. 155–156, coast of Labrador (Hopedale). Strecker (*pro parte*), 1874, Lep., p. 87. Bates, 1875, Ent. Mthl. Mag., **11**, p. 245, E. Newfoundland, Isth. of Avalon (Rantem), *leg.* Milne, 1874.

Rusticus scudderii Scudder (*pro parte*), 1877, Proc. Boston Soc. Nat. Hist., **18**, pp. 188–189, Nova Scotia (Cape Breton Isl.), *leg.* Thaxter; 1889, Butt. New England, **2**, p. 967. Perrin, 1915, Proc. Nov. Scot. Inst. Sci., **14**, p. 50, N. S. (S. E. Passage).

Lycaena aster Edwards, 1882, Can. Ent., **14**, pp. 194–195, S. E. Newfoundland (N. E. Avalon Peninsl., St. John; cp Edwards, 1883, *ibid.*, **15**, p. 44), *leg.* Mead. Gosse, 1883, **15**, p. 51, Newfoundland (very abundant in the summer of 1834 on Carbonear Isl., where every step aroused numbers . . . from the grass; not rare on Bake-Apple Marsh). Holland, 1898, Butt. Bk., p. 266, Newfoundland, *leg.* Mead, Pl. 30, figs. 40, male, 46, female, 47, male underside. Staudinger and Rebel, *argyrognomon* [auct., includ. *ismenias* Meigen] var.?, 1901, Cat. Lep. Palaear., **1**, p. 79. Nabokov, 1944, Psyche, for 1943, **50**, p. 94, N. F. (Salmonier).

Plebeius aster Wheeler, 1909, in Tutt, Brit. Butt., **3**, p. 164.

Plebeius scudderi McDunnough, 1921, Can. Ent., **53**, p. 83, Labr. (Hopedale); 1930, Can. Ent., **62**, p. 108, E. Quebec (N. shore of Gulf of St. Lawrence, Natashquan, early VIII.1929, *leg.* Brown).

Plebeius scudderi aster Freeman, 1938, Can. Ent., **70**, pp. 61–63, test figs. 3, male underside (Natashquan, *v. supra*), 4, male underside (no loc., *ex* coll.

Barnes); 1943, *ibid.*, **75**, pp. 37–39, with map, said to belong to "Hudsonian Life Zone", from Newfoundland to Labrador and Quebec prov. (*trans. ad. ssp. scudderi*).

Plebeius scudderi empetri Freeman, 1938, *loc. cit.*, Nova Scotia (sphagnum bog, about 1½ mi. north of Baddeck, Cape Breton Isl., Highw. 5, *leg.* McDunnough and Freeman, early VII.1936), ovipositing on *Empetrum nigrum* Linn., *Ledum palustre* Linn. and *Kalmia polifolia* Wangenheim; text figs. 1, holotype, underside, 2, allotype, underside, 5, male genit. (very poor); 1943, Can. Ent., **75**, pp. 37–39, with map, said to belong to "Canadian Life Zone", Cape Breton Isl. (N. of Bras d'Or Lake), Prince Edward Isl. (E. coast) and mainland of Nova Scotia (N. E.), very abundant in "*Empetrum* bogs" (but also "around clumps of *Empetrum* in windswept sand dunes"), VII.1941.

Lycaeides scudderi Nabokov, 1944, Psyche, for 1943, **50**, pl. 94, Labr. (Hopedale and Sawbill R.).

Lycaeides scudderi empetri Nabokov, 1944, *l.c.*, Nova Scotia.

Aster was the first American *Lycaeides* form observed (1834, by Gosse). In 1840 Doubleday wrote to Harris (see Scudder, Ent. Corr. Th. W. Harris, p. 144) that he had seen Gosse's unpublished drawings of a Newfoundland "Blue" resembling what is now known as *Plebejus argus* (Linn.). Both Couper (1872), and Scudder (1877) said they saw no difference between the Lycaenid under review and *scudderi auct* (*melissa samuelis* Nabokov), excepting the Cape Breton material which looked different to Scudder. The blue Labrador females do somewhat resemble small specimens of *melissa samuelis*, and it is not improbable that after Möschler's paper had appeared, and had been referred to in Staudinger's catalogue, German dealers labeled some New York males and females of *samuelis* "Labrador", which would explain the *melissa samuelis* genitalia figured as "*melissa var. aster*" by Chapman, 1917, Oberthür, Et. Lep. Comp., **14**, Pl. 15, figs. 45, 46.

Specimens examined. From Newfoundland: male (Pl. 1, fig. 7, Pl. 5, fig. 61), female, *leg.* Mead, topotypes (St. John), Ac.N.S.Phila.; 2 females, Salmonier (49 mi., S. W. from St. John), 5–15.VIII.1885, *leg.* Thaxter, M.C.Z. From Nova Scotia (Cape Breton): female, *leg.* Thaxter, *ex* coll. Scudder, M.C.Z. Specimens loaned or donated by McDunnough and Freeman to M.C.Z. from Cape Breton (among which male, Pl. 1, fig. 8, and paratypes of *empetri* Freeman, male, Pl. 5, fig. 60, 3.VII.1934, and female, Pl. 8, fig. 118, 9.VII.1936, *leg.* McDunnough, M.C.Z.), from Prince Edward Isl. (East Point and Cape Bear), New Brunswick (Pokemouche and Tabusintac) and E. Quebec (Natashquan), among which male (Pl. 1, fig. 6, Pl. 5, fig. 58), 9.VIII.1929, *leg.* Brown, M.C.Z. From Labrador: male (Pl. 5, fig. 62),

female (Pl. 8, fig. 117), VIII.1908, M.C.Z.; pair from Sawbill R., M.C.Z., and specimens (A.M.N.H., HC and M.C.Z.) from Hopedale late VIII and early IX, 1933, 1934, 1936, 1937.

Genitalic measurements. 15 males (N. F., N. S., N. B. and Labr.) showed the range: F...34–42, H...27–34, U...27–33, E...5.5–7. Without the three Labr. specimens measured, the F range would be 34–39. This *ssp.* produces the smallest FHU (from N. S. and N. B. especially) in N. America, probably a result of stunting which also affects the wing length. This stunting process acts less upon U than upon F and H, so that in the course of genitalic size fluctuations individuals of *aster* occur which are very like *a. agnata* of Sinkiang, the only known Eurasian Lycaeides form in which H tends to be smaller than U. Labrador individuals grade into *ssp. scudderi.*

Underside components of hindwing cell Cu_1 (in scale-lines)

Newfoundland (typical). Right hindwing of male. Ground (weak greyish)...13. Halo, prox. part...2. Macule (fairly strong)...8. Halo, dist. part...3. Ground...0. Prox. cretule...18. Semimacule (fairly strong)...5. Aurora (fairly bright, not extending to veins)...5. Praet. mark (rather weak, with patchy scintilla)...7. Term. space...6. Term. line...2 (rising strongly to 4 on veins).

Nova Scotia (*"empetri"*). Right hindwing male. Ground (strong greyish fawn)...5. Halo, prox. part...3. Macule (very strong)...13. Halo, dist. part...2. Ground...0. Prox. cretule...14. Semimacule (very strong)...6. Aurora (bright, not extending to veins)...5. Praet. mark (very strong, patchily rimmed with scintilla)...12. Term. space...5. Term. line...2 (rising strongly to 6 on veins).

In the first specimen the macule consists of 42 scales, in the second of 101 scales, and there is a similar difference in the number of scales forming the praeterminal mark (54 and 124).

The typical form is quite rare in collections. Male locotype, fw. 12 mm. Underside: 1. ground pale greyish; 2. light blue pulvis fairly developed; 3. macules of average generic size (1/20); 4. proximal cretules long but indistinct; 5. components of limbal series well separated; 6. reduced praeterminal marks; hardly distinguishable in fw.; 7. aurorae small; absent in fw. Very much like typical *ssp. scudderi,* but the combination of smaller size with characters 3 and 5 give it a rather distinctive appearance. Upperside: average vadum, with small inner and outer triangles in both wings. Females (worn) same size, with undersides even paler than in the male, similarly marked. Female locotype, upperside: no trace of blue; reduced aurorae in both wings;

outer cretules in hw. distinguishable. Salmonier females: aurorae very faint in hw., absent in fw.; blue dusting basally.

In the "*empetri*" form there is an extreme development of the fuscous pigmentation: 1. underside ground deepened to a dark greyish fawn; 2. pulvis reduced; 3. intense compact pigmentation of macules which are enlarged to as much as 1/12 (of the number of scale lines) in fw. and 1/15 in hw., with sometimes very drab haloes; 4. strongly pigmented and often pointed semimacules in fw.; 5. enlarged praeterminal marks in hw. with the scintilla generally placed ringwise around a black kernel; 6. strongly developed inner and outer triangles in hw. both sides and sometimes in both wings upperside; 7. fairly strong vadum in both wings upperside, usually with hw. insulae. The fw. length, the aurorae and semimacules (though more compactly pigmented) of hw., and the intervals I and praeterminal marks of fw. differ but little from those of the other *aster* forms. In the development of the discal macules in regard to the typical form, the *empetri* form may be compared to the S. Manitoba form of *ssp. scudderi* in regard to the Saskatchewan and N. Alberta specimens. The females hardly differ from typical *aster* on the upperside. Some basal blue, but generally tending to absence of overlay; aurorae absent in fw., more or less weak in hw.; hw. insulae generally clear; conspicuous outer triangles chequering hw. fringe.

The Labrador specimens differ in male underside from the typical form in the auroral components being less spaced. The females have no outer triangles and are more richly ornamented with blue than those of the two other forms and differ from S. Manitoba females of *ssp. scudderi* only in slightly reduced size (12–13, cp. 13.5–15 mm.). The New Brunswick specimens are intermediate between those from Labrador and Nova Scotia.

Lycaeides argyrognomon ferniensis (F. H. Chermock)

Pl. 1, fig. 24, left; Pl. 5, figs. 47–50; Pl. 8, figs. 103–105.

Lycaena anna Geddes, 1889, Can. Ent., **21**, pp. 57–58, S. W. Alberta (vic. Calgary).

Lycaena melissa var. annetta, prox., Dodd, 1901, Can. Ent., **33**, p. 167, vic. Calgary, 3,500–4,000 ft. alt.

Lycaeides argyrognomon Nabokov, 1944, Psyche, for 1943, **50**, p. 91, S. E. British Columbia (Fernie; Cranbrook; Michel; Lansdowne), S. W. Alberta (Calgary; Didsbury; Carbon).

Plebeius ferniensis Chermock, 1945, Can. Ent., for 1944, **76**, p. 215, Fernie, early VII, 1914–1916, *leg.* Garrett.

Specimens examined. From S. E. Brit. Col.: male holotype (Pl. 5, fig. 47), allotype (Pl. 8, fig. 103), male paratype, Fernie, 1–16.VII, *leg.* Garrett, *ex* CM, M.C.Z., and other Fernie specimens (G, A.M.N.H. and M.C.Z.); specimens from Cranbrook (female, Pl. 8, fig. 104, *leg.* Garrett, 1.VII.1914, M.C.Z.), Michel and Lansdowne (all G, A.M.N.H. or M.C.Z.). From S. W. Alberta: specimens from Didsbury (4 males, Pl. 1, fig. 24, left; Pl. 5, figs. 48–50, and female, Pl. 8, fig. 105, M.C.Z.), 1–18.VII, *leg.* Garrett (CM, A.M.N.H., M.C.Z.), and Calgary, same data.

Genitalic measurements. 15 males (from all localities) showed the range: F...38.5–47.5, H...30–36, U...29.5–35.5, E...6–8.

Underside components of hindwing cell Cu_1 (in scale-lines)

Right hindwing of holotype. Ground (whitish fawn)...13. Halo, prox. part...3. Macule (rather weak)...6. Halo, dist. part...3. Ground...0. Prox. cretule...26. Semimacule (somewhat aberrant, rather weak)...4. Aurora (fairly bright, with cusps)...8. Praet. mark (aberrantly cordate, rather strong, with compact scintilla distally)...14. Term. space...7. Term. line...1 (rising to 6 on veins).

The o.d. is very poor. I have, however, the author's types before me and so know what he meant, viz. the form I had previously distinguished as *argyrognomon*, nearctic group B2. The underside ground, which is said to be "almost brown, very much darker than in any member of this whole group of *scudderi, melissa* and *anna*", is really of an extremely ordinary whitish or dusty fawn shade (cropping up throughout the genus); much darker specimens occur in *ssp. scudderi.* The comparison of the "plain brown" female to *S. fuliginosa* (Edwards), of all things, is unfortunate, since in *ferniensis* the hindwing insulae are sufficiently in evidence, which of course is not so in the case of the other Lycaenid. Another comparison, that of the underside markings of *ferniensis* to L. Tahoe (typical) *ssp. anna*, is misleading since the limbal set in the latter is considerably weaker, while the macular radianal slant in the forewing disc is of much more frequent occurrence than in *ferniensis.* It should also be noted that the holotype is slightly aberrant, with reduced macules (to about 1/30 in forewing) and with the forewing Cu_1 II macule in an extremely distal position.

I now propose to extend the name *ferniensis* to include forms from S. E. Brit. Columbia and S. W. Alberta. Vadum in male with a tendency to widen, reaching twelve sls. in fw., with generally conspicuous terminal vadosae. Beneath a whitish or dusty-looking fawn

with more or less distinct (often very diluted, as in the holotype) haloes around the usually well-developed macules. Pulvis poor. Proximal cretules short in fw., fairly developed in hw. The main distinction from *ssp. scudderi* undersides (with which it intergrades) is in the limbal set which tends to a full development, with the aurorae more or less well cusped, attaining medially 12 sls. in hw. (and usually exceeding 6 sls.) and often represented in the fw.

These characters would hardly have served to distinguish *ferniensis* from *ssp. atrapraetextus*, had they not been combined with the following: in both sexes the wings tend to an elongated shape with a rather rounded termen in the female (which thus looks quite different from the small, dapper *atrapraetextus*). The upperside aurorae of the female are either absent (Fernie) or barely discernible in hw. (Michel) or diffusely marked in both wings (Cranbrook, Lansdowne) or fully developed and then tending to a warm fulvous (Didsbury) which, in combination with some bright basal blue, curiously recalls the S. Californian *melissa inyoensis* (Gunder), *emend.*

Lycaeides argyrognomon atrapraetextus (Field)

Pl. 1, fig. 25, left; Pl. 4, figs. 44, 46; Pl. 8, figs. 109, 110.

Rusticus melissa Elrod (*pro parte*), 1906, Bull. Univ. Montana, Biol. Series **2**, pp. 137–138 (Montana localities of this and the sympatric species hopelessly entangled), text fig. 102, male both sides (probably from Missoula Co.).

Plebejus atrapraetextus Field, 1939, J. Kansas Ent. Soc., **12**, figs. 135–136; N. Idaho (Priest R. and Laclede, Bonner Co., *leg.* Herr).

Lycaeides scudderi lotis form *atrapraetextus* Nabokov, 1944, Psyche, for 1943, **50**, p. 95, adds Uranus Peak, Shoshone Co., Id., and two Montana stations.

Plebeius scudderi race *sweadneri*, F. H. Chermock, 1945, Can. Ent., for 1944, **76**, p. 214, Uranus Peak, 5,200 ft. alt., 23.VII.1932, *leg.* Sweadner.

Specimens examined. From Idaho: Priest R., male (Pl. 1, fig. 25, left) Priest R., VII.1911, M.C.Z.; male (Pl. 4, fig. 44) and female (Pl. 8, fig. 110), 8–23.VII.1929, *ex* CM, M.C.Z.; paratypes of *sweadneri*, Uranus Peak, CM, HC and M.C.Z., of which male, Pl. 4, fig. 46, and female, Pl. 8, fig. 109. From Montana: specimens from Missoula Co. (Martina, early VII.1929, *leg.* Herr, M.C.Z.), Jackson Co. (Elkhorn Road, *ex* A.M.N.H., M.C.Z.), Cascade Co. (King's Hill, 7,000–8,000 ft. alt., 9.VII.1939, *leg.* Albright, HC), Glacier Co. (Garden Wall, 5,500 ft. alt., M.C.Z.) and Beaverhead Co. (Polaris, ST).

Genitalic measurements. 10 males (Priest R., Uranus Pk., Martina, Elkhorn, King's Hill) showed the range: F...37–48, H...29–35.5, U...30–35.5, E...6–8.

Underside components of hindwing cell Cu_1 (in scale-lines)

Priest R. Right hindwing of maxim. devel. male. Ground (fawn)...6. Halo, prox. part...2. Macule (strong)...11. Halo, dist. part...3. Prox. cretule...21. Semimacule (very strong)...12. Aurora (not very bright, though well developed, with cusps dipping into prox. triangles)...10. Praet. mark (very strong, with only 15 scintillant scales)...14. Term. space...9. Term. line...2 (rising strongly to 9 on veins).

The distinctive character of this subspecies in comparison with *ferniensis* is not so much the increase in vadum breadth (very striking in extreme examples), as the shorter wing shape, which in the female is combined with the following characters: 1. small size; 2. *melissa*-like aspect due to rather sharp forewing and well-angled hindwing; 3. sharp sagittate outline of rather narrow upperside aurora in both wings (the fulvous is of a *scudderi* yellowish tone rather than of the mellow orange found in *melissa* forms and in the Didsbury race of *ferniensis*) and 4. strong development of the hindwing inner triangles, this lending a more or less crenulated appearance to the termen.

In Priest R. males the underside varies from whitish to fawn of a shade perhaps a trifle deeper than in my darkest *ferniensis*; from the latter there is no appreciable difference in maculation, this as well as the ground being extremely variable in both subspecies. However, at what I consider to be the peak of the *atrapractextus* upperside phase (a phase remarkably paralleling *ssp. subsolanus* forms from Eastern Siberia) there are some interesting peculiarities on the underside too. In one specimen (prep. 625) the combination of strong, distinctly haloed discal macules, intensely pigmented sharp semimacules, black (more or less devoid of scintillae) praeterminal marks and a yellowish cast to the well developed aurorae produces a strong resemblance to the Asiatic subspecies. On the upperside of this largish (just over 14 mm.) individual the deep fuscous vadum is at least 20 sls. broad in both wings with vadosal patches riddling the violet blue to about another score of scale lines basad from the vadum in the forewing and throughout the disc in the hindwing. The vadum is continued distally by an intensely pigmented vadosal fringe and there is a conspicuous RM insula five or six sls. wide in both wings. All this is characteristic of the *subsolanus* upperside and also produces a homoptic resemblance

to *Icaricia shasta* (Edwards). In other topotypical males the forewing vadum varies from 12 to 15 sls. My only female specimen has no blue scales above.

Montana and Uranus Peak males vary from 3 to 15 sls. in the vadum, and the females have some blue dusting at the base of the wings.

Lycaeides argyrognomon sublivens subsp. nov.

Male holotype, prep. 142, (Pl. 1, fig. 27, left; Pl. 5, fig. 65) and 7 male paratypes (preps. 175, 176, 205–207, 426, 687), Telluride, San Miguel Mts., S. W. Colorado, alt. 10,000 to 12,000 ft., 28–30. VII. 1902, *ex* coll. Weeks, M.C.Z.

Male paratype, prep. 0469, San Miguel Mts., S. W. Colo., alt. 14,200 ft., VIII, *leg.* Oslar, *ex* coll. Williams, Ac.N.S.-Phila.

Genitalic measurements and forewing length (in 1/100 mm.)

prep. no.	F	H	U	E	
206	45	36	34	6	1300
426	46	34	35	7	1300
207	47	33	34	6	1300
687	48	35.5	32	7	1350
205	49	38	36	6	1300
175	49	36	39	6	1350
142	50	39	38	6.5	1400
176	52	37	38	8	1400
0469	52	36.5	39	7	1400
mean	48.5	36	35.5	7	1350
range	7	6	7	2	100

Of all the subspecies of *argyrognomon* hitherto discussed, this subspecies has the longest F. As will be seen it is exceeded only by the N. W. Wyoming forms which intergrade with *melissa*. The F length of the shortest individual (206) is reached by the longest (with greater wing-span) individuals of ssps. *atrapraetextus, scudderi,* and *ferniensis,* but the mean of any of those series is considerably (by more than 5) lower than the mean of *sublivens*. The relation H/U is curiously unstable. Prep. 687 is in measurements, not unlike a dwarf *ismenias,* and the long uncus lobe in the larger specimens has a *melissa* touch, but the strongly hamate, well formed, fattish falx is quite definitely that of *argyrognomon*.

It is interesting to compare this S. Colorado race to the only other southern subspecies of *argyrognomon,* the Californian *anna,* taking specimens with F min. and F max.

	anna				*sublivens*			
	F	H	U	E	F	H	U	E
min.	37	32	29	8	45	36	34	6
mean	40	34.5	33	9	48.5	36	35.5	7
max.	43	37	37	9	52	37	38	8

It is tempting to suppose that if *anna*'s dispersal eventually took on an eastward direction and that of *sublivens* a westward one, these two highly specialized subspecies would not interbreed when they met, so that somewhere in the Colorado R. region *anna*, *sublivens*, and *melissa* would occur together, as the first and third do in California.

Underside components of hindwing cell Cu_1 (in scale-lines)

Holotype, right hindwing. Ground (greyish fawn with bluish cast)...3. Halo (blurred), prox. part...4. Macule (fairly strong)...7. Halo, dist. part...4. Ground...17. Prox. cretule (blurred, difficult to measure)...10. Semimacule (rather weak)...5. Aurora (fairly bright with one thin nearal cusp anteriorly)...5. Praet. mark (strongly developed, with compact scintilla consisting of 115 scales)...14. Term. space...6. Term. line...1 (rather strongly rising to 7 on veins).

The nine specimens with good undersides I have before me are of a conveniently uniform aspect (despite the presence of one aberrational specimen, prep. 426, which lacks some of the discal macules). In general appearance this highly interesting southern Rocky Mts. representative of *argyrognomon* resembles, in the male underside and shape, *ssp. scudderi* forms of the northern Rocky Mts. region much more than it does the geographically intermediate central Rocky Mts. forms, and is very different in general aspect from the only other southern representative of the species, namely *ssp. anna* of the parallel Sierra Nevada in the West. I have not seen McDunnough's "*Plebeius scudderi*" (1916, Contrib. Nat. Hist. Lep. Amer. **3**, p. 110) from Silverton, S. W. Colo.

The following combination of characters seems unique: 1. Shape: conspicuous extension and angulation of the hindwing (the hw. termen in the holotype at the end of veins Sc, Rs, M_1, M_2, M_3, Cu_1, Cu_2, 2A, goes through scale-lines 110, 140, 160, 168, 170, 165, 150, 130, respectively) with rather pointed but comparatively underdeveloped forewing (the fw. termen in the holotype at the end of veins R_4, M_1, M_2, M_3, Cu_1, Cu_2, 2A, goes through scale-lines 200, 212, 210, 200, 190, 178, 165, respectively), as if the forewing were less successful in dealing

with altitudinal stunting than the hindwing; 2. Underside ground: a curiously bluish, dull, darkish fawn, shading into "livid," due to the fact that the well pigmented scales of the ground are evenly intermixed with a discally extending spread of pulvis and with abundant bluish drab hair scales. The haloes and the pointed but shortish cretules are not conspicuous owing to the blurring effect of the bluish dusting; 3. Small, separate, *scudderi*-like, but fairly bright aurorae in hind wing (see measurements of cell Cu_1 in holotype, *supra*); very weakly represented in forewing; 4. A fair development of all the fuscous markings, even the rare outer triangles of forewing ("checquered" fringe) being represented more or less clearly (in preps. 175 and 687, for instance). In the holotype the discal macules are of generically average size (1/20) in the forewing and above average (1/17) in the hindwing. Their disposition in fw. (holotype: R_4 156–162, M_1 154–162, M_2 150–159, M_3 138–149, Cu_1 111–126, Cu_2 112–121, 1A 116–123) is somewhat affected by the apical strain, the curve of the series R_4 to M_3 being rather "open" and macule Cu_1 lagging behind; 5. The semimacules and praeterminal marks tend to assume a triangular (basad pointed) shape.

It should be noted that the bluish fawn of the ground is approached by one or two N. Alberta (one Laggan male, for instance) individuals of *scudderi*—among the much more usual whiter or greyer or browner ones—but that in such individuals the maculation is less developed than in *sublivens* with none of the *sublivens* tendency (prep. 206 for instance) towards heaviness in the semimacules, and the aurorae though similarly shaped, are less bright. It was this development in intensity of pattern that caused me to provisionally lump the S. Colorado race with other more or less strongly marked forms, such as *lotis* and *atrapraetextus*, in my preliminary notes on the subject (1944, Psyche, for 1943, **50**, p. 95).

The somewhat faded specimen prep. 0469 seems less bluish below than the rest (though the livid shade of the dull fawn can be distinguished), and the aurorae in the smaller specimens are still narrower than in the holotype, but otherwise, as already mentioned, the series is very uniform.

The upperside is very conventional; an average vadum, with a suggestion of hindwing insulae in some of the paratypes.

A *Lycaeides* female from San Isabel Forest, mentioned in my preliminary notes (1944, *l.c.*) is an extraordinary looking specimen, shaped like the males (with a "lagging" forewing, 13.5 mm. in length), of a uniform fuscous except for some silky drab bluish hairs in the hw.

basally, with a fuscous shade to the fringes and a mere suggestion of small, quite blurred aurorae and insulae in the hindwing. The underside (Pl. 5, fig. 65) is very like the Telluride males with the maculation more pronounced, but whether it really belongs here is not certain.

Lycaeides argyrognomon longinus subsp. nov.

Male, holotype, prep. 144 (Pl. 1, fig. 31) and allotype (Pl. 8, fig. 106), Jackson's Hole, N. W. Wyoming, 26.VII.1900, *ex* coll. Paine, M.C.Z.

Male, paratype, prep. 140 (Pl. 1, fig. 32), Jackson's Hole, N. W. Wyoming, 25.VII.1900, *ex* coll. Paine, M.C.Z.

Male, paratype, prep. 303 (Pl. 1, fig. 33, Pl. 5, fig. 64), Jackson's Hole, N. W. Wyoming, *circa* 43° 30N, 110° 46W, alt. 4,746 ft., mid VII.1920, A.M.N.H.

Genital measurements. Prep. 144, holotype: F...55, H...38, U...42, E...8. Prep. 140, paratype: F...57, H...43, U...39, E...7.5. Prep. 303, paratype: F...56, H...39, U...37, E...6.5.

Specimen 144 is somewhat worn, but I select it as the holotype of the whole subspecies (instead of choosing one of the two fresh males 140 and 303), partly because of its genitalic measurements which expose better certain trends that I wish to stress, and partly because of its having been taken *in copula*, with the allotype, thus leaving no doubt as to their being conspecific. Its falx is of the normal (N) type to which *argyrognomon* invariably belongs, with conspicuously hamate tip. In F it exceeds the longest *argyrognomon* from E. Asia by as much as 8 and the longest European *argyrognomon* (from Spain) by even more (11), and equals the F of the smallest *melissa* unci. There is, however, no great hiatus between it and the other longest nearctic *argyrognomon* F (from Colorado) and I do not doubt that the gap will be completely bridged when more material is available. Thus, by rather arbitrarily assigning the present form to *argyrognomon*, we may say that whereas the known range for F of the Eurasian *argyrognomon* group is 32–47, that of the nearctic group is extended to at least 33–55, overlapping Asiatic *ismenias*, individuals of which are already reached by the Coloradian subspecies of *argyrognomon*. In H it has little affinity with *ismenias*, being much shorter in its relation to F and not thinning out as it tends to do in that species (and to a still gre ter degree in *melissa*). While equaling the larger nearctic *argyrognomon* individuals, it falls slightly short (by 3) of the longest Asiatic H and by as much as 6 of the longest European one. In U it exceeds the holarctic limit slightly and its ratio U/H is more than 1. This ratio (42/38) is approached by sundry nearctic individuals, and is in keeping

with the logic of the evolution of *argyrognomon* in America where H lags behind while U grows with F (it is the other way round in Eurasia). On the other hand, 42/38 is large enough to indicate a true affinity with *melissa*. Indeed a loss in thickness less than the difference between, say, southern and northern individuals of the Cascade Mts. forms of *argyrognomon*, together with a weakening of the hook, would be enough to change *longinus* (holotype) into *melissa*. As will be seen further, in the Jackson Lake region such intergradation actually does occur, apparently within the same colony or array of connected colonies. At this point of its development *argyrognomon* does turn into *melissa* (from which, however, only 300 miles to the west, it is sharply separated in all characters). That it wavers here at the crossroads of evolution and may select another course, is proved by the *ismenias*-like genitalia of the paratypes.

Both paratypes reveal an *ismenias*-like uncus. The falx is of a common (Asiatic) *ismenias* type, intermediate between N and W, well elbowed, with a long slender F, hamate at tip, a slender H from medium to long, somewhat exceeding the length of the U which is by 3–5 shorter than in the holotype (but intergrades with the latter through the sympatric melissoid forms to be discussed further). There is no doubt in my mind whatever that prep. 140 comes from the same colony as the specimen selected as holotype, and this (in conjunction with ismenioid tendencies in the Colorado subspecies of *argyrognomon*) makes me most reluctant to separate the form which the paratypes represent from the bulk of nearctic *argyrognomon* as an American subspecies of *ismenias*. I also suggest that some *ismenias*-like specimens might be produced, among melissoid ones, through pairings between *melissa* and "long" *argyrognomon*, whereas the initial Eurasian *ismenias* was most probably evolved directly from *argyrognomon* by isolation in some very favorable Asiatic nook, after which it spread into regions where less favorable conditions had kept other *argyrognomon* colonies in a more or less short-falx state. Anyhow, the similarity between the genitalia of *longinus* (paratypes) and some of the Asiatic forms (for instance Honshu, prep. 146, F...55, H...44, U...40, E...7.5, or Quelpart Isl., prep. 438, F...57, H...43.5, U...38, E...7, or Szechwan, prep. 284, F...55.5, H...43.5, U...40, E...7), is most extraordinary.

Underside components of hindwing cell Cu_1 (in scale-lines)

Left hindwing of holotype. Ground (weak whitish fawn)...12. Halo, prox. part...4. Macule (fairly strong)...5. Halo, dist. part...4. Ground...7.

Prox. cretule...24. Semimacule (fairly strong)...5. Aurora (bright, with neural cusps)...9. Praet. mark (fairly strong, with patchy scintilla)...13. Term. space...7. Term. line...2 (rising to about 5 on veins). The same remarks in parenthesis apply to the corresponding sequence in right hindwing of prep. 303, paratype: 2, 3, 9, 4, 10, 20, 8, 7, 12, 6, 1.

Description of holotype. Forewing length 12.5 mm. Vadum of both wings poorly developed (hardly 5 sls. in fw.), with weak inner fringes and weak inner triangles. Underside: ground a shade whiter than the fawn or whitish fawn Idaho races, with the turquoise pulvis more in evidence than is generally the case in *ferniensis* or *atrapraetextus* and thus producing in this and the two other males a false resemblance to topotypical *lotis*. Discal macules of average development in forewing, placed as follows (haloes not included): forewing: R_4 123–129, M_1 125–132, M_2 119–127, M_3 110–120 (extended, ovoid, directed costobasad, towards sl. 50 of costa), Cu_1 95–110 (still more extended, directed towards sl. 35 of costa), Cu_2 102–106, 1A 104–108; slightly below average in hindwing, with M_3 reduced and the colon obsolete. Aurorae in fw. represented only proximally, in strong interspaces; in hw. rather small (see measurements of Cu_1), loosing their cusps costad from M_3 and tornad from Cu_1. Cretules well developed. Terminal space white and conspicuous, despite the faded condition of the margin.

Paratypes. These two males, with *ismenias*-like organs are quite similar to each other and both slightly differ from the holotype by exaggerating its characters. In spite of the rather pale whitish-grey ground, the beautifully developed cretules and white terminal space of hindwing are strongly in evidence. The whole subspecies belongs to the "strong" *argyrognomon* section (which in a preliminary survey, Psyche, **50**, p. 95, I had grouped under "*scudderi lotis*") that is with brightly colored, comparatively well-developed (though small) aurorae. In that section the conspicuous breadth and whiteness of the terminal space is unusual. Moreover, the whole discal series is further basad (or the space between discal and limbal series broader) than is the case in neighboring forms, while the ornamentation has a kind of neat narrowness which in conjunction with the extended hw. spaces mentioned gives the two specimens a characteristic look.

It may be added that *ismenias* is much too polymorphic in alar characters to enable one to draw any relevant comparison between the two paratypes and the Eurasian species.

Allotype. Forewing length 14 mm. Underside very like the male holotype, with the discal maculation slightly stronger, but still fairly weak for a female. Though not so conspicuous as in the paratypes the

various characters of the males are preserved, but the semimaculas are somewhat more pointed and the aurorae in both wings are somewhat larger and paler. In the "long" wing shape, the rather weak fuscous of the upperside ground (with very vague traces of basal blue in hw.) and the rather diffuse edges of the well developed, connected, rather bright but "melting" aurorae in both wings, the general aspect of the upperside is very like *ferniensis* specimens from Didsbury, Alberta, or an Idaho form from Hailey Hot Springs (both quite different, in two different ways, on the underside, Didsbury having a more brownish fawn cast, with weaker cretules, and Hailey having the cretules quite undistinguishable from the white ground and a considerably stronger maculation).

Specimens forming transition to melissa melissa. Under this new name I find it convenient to list four additional Wyoming males, which form a perfect transition to *melissa*. The specimens are: prep. 427 (Pl. 1, fig. 36), vic. Moose, Teton Ntnl. Park, alt. 6,700 ft., 22.VII.1929, *leg.*, Klots, *ex* A.M.N.H., M.C.Z. (presumably from a batch to which Klots, 1930, Bull. Brooklyn Ent. Soc., **25**, p. 165, refers under "*Plebeius melissa*" as taken in a region where three "Life Zones" were noted within a horizontal distance of 6 miles); prep. 695 (Pl. 1, fig. 37), Blacktail Butte, Teton Mts., late VI.1931, M.C.Z.; and 2 males, preps. 252 (Pl. 1, fig. 34) and 145 (Pl. 1, fig. 35), Jackson's Hole, 14–25.VII.1900 *ex* coll. Paine, M.C.Z.

Genitalic measurements. Prep. 427: F...50, H...34, U...39, E...5.5. Prep. 695: F...56, H...37, U...42, E...5.5. Prep. 145: F...53, H...39, U...40, E...7.5. Prep. 252: F...50, H...35, U...39, E...7.5.

Prep. 427 and 695 are small (but otherwise fairly typical) *melissa* organs, with thin, weakly hamate forearm, medially thin H, and comparatively long U. The FHU of prep. 427 is especially small for *melissa* although the wing-length is quite normal. Prep. 145 and 252 offer an intermediate aspect, between *argyrognomon* and *melissa*. Prep. 252 is extremely close to the holotype of *argyrognomon longinus* but is somewhat smaller with a weaker hook to the forearm. Prep. 145 is close to *argyrognomon* forms in the long H which is subequal to the U, but the tapering forearm with a very weak hook is definitely that of *melissa*. In other words these two specimens represent a perfect link between *melissa* and *argyrognomon* (as represented by *argyrognomon longinus*). An interesting point is that prep. 252 differs from 427 only in a general thickening of the falx, the length measurements being about the same.

Alar characters. Prep. 427: forewing length 13.5 mm. The underside characters distinguishing this from the typical series of *argyrognomon longinus* are: the considerably (at least twice) shorter distance between the discal and limbal series in hindwing, the duller, drabber, greyish tone of the ground and the better development of the hindwing basal and discal macules, which, in conjunction with the shorter stretch II-I (20 sls. in Cu_1 instead of 35 as in the holotype of *argyrognomon longinus*) produces a "*melissa*" effect. The terminal space is as well developed as in *longinus*. From forms of *melissa melissa* all four specimens may be distinguished by the discal maculation being a fraction lower in development (size, intensity), than average (while it tends to rise above average in *ssp. melissa* forms), by the lesser extension of interval I and by the more conspicuous terminal space. Preps. 252 and 142 have the characters of prep. 427 underside still more pronounced, with á tan shade to the ground and a still wider terminal space (unusually conspicuous in 252). The Blacktail Butte specimen (695) is intermediate in appearance between the specimens described and *argyrognomon longinus*, the links being (as differing from 427, 252, and 142): a more powdery greyish blue tone of underside ground and a slightly more extended II-I stretch, hw. (in genitalia, however, 695 is a typical "small" *melissa*).

That these transitional specimens came from colonies in which "long" *argyrognomon*, "shortish" *melissa* and "medium" *ismenias* were genitalically represented is a possibility that the taxonomist must face.

Lycaeides melissa melissa (Edwards)

Pl. 1, figs. 9, 10, 12, 22, 38. Right organ in sympatric sets, figs. 17–21, 23–27. Pl. 5, figs. 67–70, Pl. 6, figs. 71–74, 79–86, 94; Pl. 9, figs. 72, 126–132, 136–138.

Lycaena anna Reakirt, 1867, Proc. Ent. Soc. Philadelphia, **6**, p. 147. Rocky Mts. (Colorado Terr.), California. Edwards, 1872, in Hayden, Apt. U. S. Geol. Surv. Montana and Adjac. Terr., **5**, p. 467, N. W. Montana (Pleasant Vy.). Maynard (*pro parte*), 1891, Amer. Butt., p. 161.

Lycaena melissa Edwards, 1873, Trans. Amer. Ent. Soc., **4**, pp. 346–348, Colorado, *leg.* Mead (type loc.: Park Co., between Fairplay and Californian Gulch, on the way to Mosquito Pass, 9,500–13,188 ft. alt., 8.VII.-1871; on Mead's labels this appears as "Divide between the Arkansas and S. Platte Valleys", see Brown, 1934, J. N. Y. Ent. Soc., **42**, pp. 155–156), also Nevada and Arizona. Strecker, 1874, Lep., p. 88, Pl. 10, figs. 8, male both sides, 9, female (Calif.?). Mead, 1875, in Rpt. U. S. Geog. and

Geol. Survey W. of 100 mer., **5**, p. 783, Centr. Colo. (vic. Denver; vic. Fairplay, types; S. Park; Twin Lakes, same *ssp.*?), Pl. 36, figs. 5, 6, male both sides, 7, 8, female both sides (typical specimens). Edwards, 1878, in Hayden, Bull. U. S. Geol. and Geog. Survey, **4**, p. 517, Montana, grassy plains and slopes, ranges from Ariz. to Brit. America. Snow, 1878, Trans. Kansas Acad. Sci., **6**, p. 72, Centr. Colo. (S. Park, via Ute Pass); 1881, *ibid.*, **7**, p. 62, Centr. Colo. (Chicago Cr. Canyon, vic. Idaho Spr., 7,600 ft. alt.); 1883, *ibid.*, **8**, p. 36, New Mexico (Gallinas Can., vic. Las Vegas Hot Spr., 7,000 ft. alt.). Maynard, 1891, Man. N. Amer. Butt., p. 165, adds Kansas. Danby, 1894, J. N. Y. Ent. Soc., **2**, p. 33, Vancouver Isl. (Goldstream; same *sp.*?). Saunders, 1894, 25th Ann. Rpt. Ent. Soc. Ontario, **1894**, p. 5, S. Manitoba (Winnipeg, *leg.* Hanham). Heath, 1895, Can. Ent., **27**, pp. 311, 313, S. Manit. (vic. Cartwright, "rolling grassy prairie" *teste* Fletcher, *ibid.*, p. 314). Truman, 1896, Ent. News, **7**, p. 298, South Dakota (vic. Volga, prairie). Holland (*pro parte*), 1898, Butt. Bk., p. 265, Pl. 31, fig. 25, male (labeled "Mead Collection, Colorado" in Edwards' hand, Carnegie Mus.). Cary, 1901, Can. Ent., **33**, p. 310, Nebraska (Sioux Co.). Browning, 1901, Ent. News, **12**, p. 299, Utah (vic. Salt L., 4,225 ft. alt.). Staudinger and Rebel, *argyrognomon* (both Eurasian species) *var* ?, 1901, Lep. Palaear., **1**, p. 78, Bor. Amer. and "Kamchatka" (*false*). Wright, 1906, Butt. W. Coast, p. 225, "in valleys, on mountains, and in deserts, wherever it pleases to go" (for figures see under *ssp. inyoensis*, into which the specimens grade). R. C. Williams, 1914, Ent. News, **25**, p. 264, New Mexico (Jemez Mts.). Holland, 1931, Butt. Bk., rev. ed., p. 264, Pl. 31, fig. 25, male (*v. supra*, 1898) and Pl. 66, fig. 17, female, designated as types, the latter wrongly since its label reads "California" in Edwards' hand (Pl. 31, fig. 26 which represents *argyrognomon anna* female, is also designated as *melissa* "type"). Forster, 1936, Mitt. Münchner Ent. Ges., **26**, pp. 81–84, Pl. 4, No. 418, male genit., "Kamchatka" (*false*).

Lycaeides anna Scudder, 1874, Proc. Boston Soc. Nat. Sci., **17**, p. 88, S. W. North Dakota (Heart R., 1,800 ft. alt., timber and open country) and E. Montana (Cedar Cr., 2,200 ft. alt., among the sage brush of Yellowstone R. Valley).

Rusticus melissa Scudder, 1877, Bull. Buffalo Soc. Nat. Sci., **3**, p. 122; 1878, in Hayden, Bull. U. S. Geol. and Geog. Surv., **4**, p. 256, Utah (vic. Beaver: Bear Valley and Beaver Mts.). Rivers, 1905, Bull. S. Calif. Acad. Sci., **4**, p. 48, S. Calif. (common in Arroyo Seco, *teste* Grinnell; same *ssp.*?). Elrod (*pro parte*), 1906, Bull. Univ. Montana, Biol. Series, **2**, pp. 137–138, Montana (determinations unreliable, several stations listed), Pl. 11, fig. 5, female, fig. 6, male both sides, text fig. 93, venation (very poor; text fig. 102 represents *argyrognomon atrapraetextus*, *q.v.*). Cary, 1907, Proc. U. S. Ntnl. Mus. **31**, p. 454, N. Alberta (vic. Dunvegan, Upper Peace R., about 2,500 ft. alt., *leg.* Macoun; this species?). W. S. Wright, 1908, J. N. Y. Ent. Soc., **16**, p. 164, S. Calif., San Diego Co. (Morena Dam, "took 100

specimens one evening after sundown, picking them off the grass"; Mission Vy., smaller than those in the mountains). Russel, 1910, Can. Ent., **42**, p. 227, S. W. Brit. Col. (Princeton Summit, 6,000 ft. alt., and Skajet Vy.; this species?). Lindsey, 1917, Ent. News, **28**, p. 351, N. Iowa ("very common in Dickinson Co. and ranging east in small numbers to the Mississippi").

Plebeius melissa Kirby, 1877, Syn. Cat. Diurn. Lep. (Suppl.), p. 771. Wheeler, 1909, in Tutt, Brit. Butt., **3**, p. 164. Chapman, 1909, *ibid.*, (p. oppos. Pl. 50); 1910, Ent. Rec., **22**, p. 101; 1917, in Oberthür, Et. Lep. Comp., **14**, pp. 42–46, 51–53, 55–56, Pl. 9, fig. 25, male genit., California; 1918, Ent. Rec. **31**, pp. 2–8, text fig. 8, androc., Pl. 3 (same as in Oberthür). McDunnough, 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, pp. 110–111. Blackmore, 1920, Proc. Ent. Soc. Brit. Col., Syst. Series, **14**, p. 7, S. Brit. Col. (from Vancouver Isl. to Rocky Mts.), Pl. 1, fig. 3, male underside (similar to N. Calif. specimens, possibly from Vanc. Isl.). Lindsey, 1921, Proc. Iowa Acad. Sci., **27**, p. 320, W. Iowa (Sioux City, 1917). Gunder, 1927, Can. Ent., **59**, Pl. A, fig. 1a, male underside (Calif.?). Brodie, 1929, Trans. R. Can. Inst., **27**, p. 84, Manitoba (adds Victoria Beach). Klots, 1930, Bull. Brooklyn Ent. Soc., **25**, p. 165, S. E. Wyom. (Fox Park, alt. 8,500 ft., grassy meadows and sagebrush flats) and N. Colo., 5,200–6,500 ft. alt. (Bellevue; Spring Cn.; Little S. Poudre R.). Fender, 1931, Pan. Pacif. Ent., **7**, p. 186, N. W. Oregon (fields south of McMinnville). Calkins, 1932, Ent. News, **43**, p. 258, W. Kansas (Scott Co.), reared on *Medicago sativa* Linn., abundant. Macy and Shepard (*pro parte*?), 1941, Butt., pp. 172–173, western plains of Minnesota (Erhard; Orleans; Sedan; Morris; Browns Vt.; Odessa Township) and S. E. Minn. (Olmsted Co.). Brooks, 1942, Can. Ent., **74**, p. 35, Manitoba (adds Transcona, Bird's Hill, Beulah and Birtle). Leighton (*pro parte*?), 1946, Univ. Washington Publ., Biol., **9**, p. 61, E. Washington (several stations, determinations unreliable).

Lycaena acmon var. melissa Aaron, 1884, Papilio, **4**, p. 52. Edwards, 1884, *ibid.*, p. 92, prep. stages, eggs laid on *Astragalus bisulcatus* Gray (*prox.*) *teste* Goodale, at Pueblo, S. E. Colo.

Cupido melissa Butler, 1900, Ent. **33**, p. 124.

Lycaena argus var. melissa Bang Haas, 1926, Novit. Macrolep. Kat., **1**, p. 83.

Plebejus melissa, J. A. Comstock, 1927, Butt. Calif., p. 183, larval foodplants, *Astragalus*, *Lotus* (fancifully derived from "*lotis*"?), Pl. 53, fig. 20, male, Flagstaff, Ariz., 27.VII.1916, figs. 21, 22, both sides of female, Mammoth Camp, Mono Co., Calif., 22.VII.1922. Blackmore, 1927, check-list Macrolep. Brit. Columbia, p. 11 (apparently throughout the Province except "N. Interior" and "Coast Region"). J. A. Comstock, 1929, Bull. S. Calif. Acad. Sci., **28**, p. 24, larva on *Glycyrrhiza lepidota* (Nuttall) *teste* Dammers, vic. Blythe, Riverside Co., S. E. Calif., raised on Wistaria, Pl. 9, fig. d, larva, figs. a, b, c, pupa, pupal stage 9 days. W. S. Wright, 1930, Trans. San Diego Soc. Nat. Hist., **6**, p. 28, San Diego Co., "very

common in low places", vetch and sweet clover attractive. Leussler, 1938, Ent. News, **49**, p. 278 and **50**, p. 38, Nebraska ("extremely common in western part . . . less so eastward . . . at Lincoln very rare . . . at Omaha only one specimen in 28 years"). Field, 1938, Bull. Univ. Kansas, **39**, pp. 170, 278, 288, western third of Kansas (Counties: Rawlins, Wallace, Meade, Scott, Gove), larval foodplants: *Astragalus*, *Acmispon americanus* (Nuttall).

Lycaeides insularis exerge *melissa* Verity, 1931, Iris, **45**, pp. 33–34.

Lycaeides melissa Stempffer, 1931, Ann. Soc. Ent. France, **100**, pp. 126–128, Pl. 2, fig. M, Pl. 3, fig. 4, male genit.; 1933, Bull. Soc. Ent. France, **38**, p. 110, Scott City, Kansas. Nabokov, 1944, Psyche, for 1943, **50**, pp. 87–89, 96–97, adds Idaho and Texas, defines local form from Gold L. and Mammoth L., E. Calif.; 1945, Psyche, for 1944, **51**, pp. 111, 116–117, Pl. 5, underside, Colo. (low elev. form).

Rusticus scudderi Kite, 1934, Ent. News, **45**, p. 39, Missouri (Holister, Lake Tanegcome region), "early April . . . rather scarce after June" (perhaps not a *Lycaeides* at all; the Kite collection is at School of Ozarks, Point Lookout, *teste* Meiners, 1941, Ent. News, **52**, p. 120).

Plebejus melissa lotis Garth, 1935, Bull. S. Calif. Acad. Sci., **33**, p. 135, **34**, p. 67, Yosemite Ntnl. Prk. (Boundary Hill Research Reserve; Lake Benson, 8,000 ft. alt.). Field, 1938, Bull. Univ. Kansas, **39**, p. 278, Scott Co., "occurrence due to the force of the wind" (could hardly have brought it from Inyo Co. Calif.). Blevins and Blevins, 1945, Bull. S. Calif. Acad. Sci., **43**, p. 122, Sequoia Ntnl. Park, Calif. (this *ssp.*?).

Plebeius melissa paradoxa F. H. Chermock (*pro parte*), 1945, Can. Ent., for 1944, **76**, p. 214, Twin Peaks, Tuolumne Co., Calif., paratypes.

Plebeius melissa fridayi F. H. Chermock, 1945, *ibid.*, p. 215, Gold L. and Mammoth L., Calif.

Specimens examined. From Colorado: vic. Fairplay, female (Pl. 6, fig. 72, Pl. 9, fig. 72), topotype, *leg.* Mead, 8.VII.1871, SCD, M.C.Z.; 2 males (Pl. 1, fig. 9, and Pl. 6, fig. 71), Alma, Park Co., 10,000 ft., 13–14.VIII.1877, *leg.* Snow, SCD, M.C.Z.; female, purch. from Edwards, SCD, M.C.Z.; male, Beaver Brook, Park Co., 6,000 ft. alt., 11.VII.1877, *leg.* Snow, SCD, M.C.Z.; male Rocky Mts., *ex* coll. Reakirt, M.C.Z.; specimens from Mt. Ouray, 12,000–13,000 ft. alt., 6.VIII.1902, AGW, M.C.Z. (of these male Pl. 1, fig. 27, right), White R. (SCD, M.C.Z.), Starr Ranch, El Paso Co., 6,300 ft. alt. (HC and M.C.Z.), Boulder (*leg.* Nabokov, M.C.Z.), Durango (Ac.N.S.Phila.), La Veta (ST and M.C.Z., of these males Pl. 6, figs. 73, 74) and Chivington (ST and M.C.Z., of these female, Pl. 9, fig. 119). Specimens from Kansas (Scott City), Nebraska (Monroe Co. and Cherry Co., A.M.N.H. and M.C.Z.), N. Dakota (Heart R., mentioned by Scudder, 1874, *leg.* Allen, M.C.Z.), S. Dakota (Rapid City, R.R., M.C.Z.),

Arizona (male, purch. from Edw., SCD, M.C.Z., pair from Bright Angel, Grand Canyon, Ac.N.S.Phila.). From California: San Diego Co., *leg.* Creelman, ST, HC, Ac.N.S.Phila. (Laguna; Coronado; Warners, male, Pl. 1, fig. 12, M.C.Z.; Pine Vy., male, Pl. 6, fig. 94, female, Pl. 9, fig. 137, M.C.Z.; Cuyamaca L., female, Pl. 9, fig. 137); Tuolumne Co. (Twin Peaks, male paratype of *paradoxa* Chermock, *ex* HC, M.C.Z., and Red Mts., ST); Mono Co. (Mammoth L., ST); Sierra Co. (Gold L., pair, paratypes of *fridayi* Chermock; female, Pl. 9, fig. 136, ST; males, Pl. 1, fig. 17, right, and Pl. 6, fig. 81, VII.1934, *ex* HC, M.C.Z.); Modoc Co. (Davis Cr., male, Pl. 6, fig. 80, M.C.Z.); Mendocino Co. (male, Pl. 1, fig. 18, right, Pl. 6, fig. 79, and female, Pl. 9, fig. 130, both 7.VI.1937, *ex* CM, M.C.Z.). From Nevada (Fallon, 5,000 ft. alt., alfalfa field, *leg.* Bell, H, *ex* A.M.N.H., M.C.Z., of these two males, Pl. 1, fig. 10, Pl. 6, fig. 82, and female, Pl. 9, fig. 131. From Oregon (Durkee, of these female, Pl. 9, fig. 126, late V.1941, *leg.* Baker, *ex* HC, M.C.Z., and Forth Klamath, male, Pl. 1, fig. 19, right). From Idaho (Kuna, of these male, Pl. 1, fig. 26, right, 10, VII.1939, *ex* ST, M.C.Z.; Twin Lakes, male, Pl. 1, fig. 25, right, *ex* ST, M.C.Z.; Nounan and King's Hill, M.C.Z.). From Utah, (Eureka, *leg.* Spalding; Park City, 9.VII.1895, *leg.* Snyder, City Creak Cn., 3.VII.1899, *leg.* Skinner, all these M.C.Z.), and the following (*leg.* V. and D. Nabokov, 1943, M.C.Z.): Salt L. City (Walker's Lane, 21.VII, of which male, Pl. 6, fig. 83), road to Alta (5,500 ft. alt., VII–VIII, of which male, Pl. 6, fig. 84, female, Pl. 9, fig. 132) and Alta, Wasatch Mts. (8,500 ft. VII–VIII, of which male, Pl. 6, fig. 85, female, Pl. 6, fig. 86, these *trans. ad ssp. annetta*). From Montana (Virginia City and Gold Butte, M.C.Z.). From Wyoming (Buffalo, of which male, Pl. 1, fig. 38, *leg.* P. S. Remington, M.C.Z., and Diamond Ranch, Platte Co., 6,000 ft. alt., *ex* A.M.N.H., M.C.Z.). From Washington (Yakima City; Yakima R., Nelson's; opp. Ellensburg; Colville Vy., Brown's, all these VII–IX.1882, M.C.Z.); Port Columbia (=Brewster), *leg.* Hopfinger, of these male, Pl. 1, fig. 20, right. From Brit. Columbia (Sicamous and Okanagan Falls, of these two males, Pl. 1, fig. 21, right, and fig. 22, *leg.* Garrett, G, *ex* A.M.N.H., M.C.Z.). From Alberta (Didsbury 18.VI–18.VII, *leg.* Garrett, of which two males, Pl. 5, fig. 67, and Pl. 1, fig. 24, right, Pl. 5, fig. 68, and female, Pl. 9, fig. 127, *ex* CM and *ex* A.M.N.H., M.C.Z.; specimens from Carbon, Calgary, Lethbridge, End Mt. and Blackfoot Hills ST, CM and M.C.Z.). From Saskatchewan (Fort Qu'Appelle, Ac N.S.Phila. and Lloydminster, purch. from Fitch, of which male, Pl. 5, fig. 69, female, Pl. 9, fig. 128). Manitoba (Birtle, male, Pl. 5, fig. 70, female, Pl. 9, fig. 129, *ex* ST, M.C.Z.;

Riding Mts., of which male, Pl. 1, fig. 23, right, mid VII.1927, H, *ex* A.M.N.H., M.C.Z., and specimens from Beulah, Miniota and Sand Ridge, vic. Kelwood, CM, ST, Ac.N.H.Phila. and M.C.Z.).

Genitalic measurements. 60 males (from all states and provinces mentioned above) showed the range: F...47.5–69, H...32.5–44.5, U...37–50, E...4.5–7. By measuring the wings of these specimens it has been calculated that an increase of 400 (same units), say from 1,000 to 1,400, in forewing length, corresponds on the average to 14 in F, 9 in H, 9 in U, and 2 in E.

Underside components of hindwing cell Cu_1 (in scale-lines)

Alma, Colo., typical form. Left hindwing of male. Ground (weak fawn)...5. Halo, prox. part...4. Macule (strong)...8. Halo, dist. part...3. Ground...0. Prox. cretule...18. Semimacule (strong)...4. Aurora (fairly bright, isolate, without cusps)...8. Pract. mark (strong, with strong scintilla)...11. Term. space...8. Term. line...2 (rising to 4 on veins).

Vic. Fairplay, Colo., topotypical. Left hindwing of female. Ground (weak fawn)...8. Halo, prox. part...4. Macule (strong)...11. Halo, dist. part...3 Ground...0. Prox. cretule...10. Semimacule (strong)...5. Aurora (as in male above)...13. Praet. mark (strong with patchy scintilla)...14. Term. space...5. Term. line...2 (rising to 4 on veins).

La Veta, Colo., low elev. rich form. Right hindwing of male. Ground (solid fawn)...3. Halo, prox. part...3. Macule (strong)...9. Halo, dist. part...4. Ground...9. Prox. cretule...10. Semimacule (strong)...6. Aurora (bright, with fairly developed cusps)...17. Praet. mark (strong, with proximally placed scintilla intruding upon aurora)...11. Term. space...5. Term. line...2 (rising to 6 on veins).

Birtle, Manit., predominant north western form. Left hindwing of male. Ground (greyish fawn)...10. Halo, prox. part...3. Macule (strong)...10. Halo, dist. part...4. Ground...3. Prox. cretule (rather blurry proximally)...15. Semimacule (strong, except proximally)...9. Aurora (bright, thin neural cusps reaching neural triangles)...11. Praet. mark (strong, with wreath-like scintilla)...14. Term. space...5. Term. line...1 (rising to 3 on veins).

Salt L. City, Ut., transitional to low elev. south western forms. Left hindwing of male. Ground (as above)...3. Halo, prox. part...4. Macule (strong)...9. Halo, dist. part...3. Ground...0. Prox. cretule...12. Semimacule (strong distally)...8. Aurora (rich, cusps stronger than in preceding)...12. Praet. mark (as in preceding)...14. Term. space...5. Term. line...2 (rising to 6 on veins).

The typical form is weak fawn below in both sexes with well developed and fairly distinct white elements, producing a general im-

pression of "whitish buff" (Edwards' original description), while the drab look of not-too-fresh specimens (and a comparison with the white ground of *anna*) may have suggested the "grey" in Mead's notes. The pulvis (pale blue) is rather conspicuous, the macules above average strength and size in both wings, the aurorae of average development in the forewing, somewhat reduced and isolated in hindwing, especially in the male. On the brown upperside of the female the blue is reduced to some basal dusting in hw. and the aurorae are connected, forming bands in both wings around 12 scale lines broad in hw. (Cu_1, M_3), with crenulated prox. margin and well developed cusps, and somewhat broader in fw., with straight prox. margin and shorter cusps that do not reach the terminal line as they do in fw. From other stations in Colorado I have similar females often with the addition of dingy white or bluish distal cretules in hw., bringing out conspicuously the terminal line and the praet. insulae.

In material from lower altitudes in Colorado, N. Mexico and Arizona, the size increases from 13 to 15 mm. (in fw.), the ground ranges from typical to a strong fawn (sometimes almost egg brown, especially in females) the pulvis is much reduced, the cretules tend to be short in both wings (but fuse with the haloes in specimens with reduced space between macules and semimacules) and the macules and aurorae are sometimes very strong. In females of this group, the bright blue overlay is often well developed, spreading (at the maximum of subspecific extension) over the hw., from base to the semimacules (which are left out in strong ground fuscous) and from R_s to dorsum, and in the fw. more sparsely invading the M part of cell RM, the apices of cells M_3 and Cu_2 and the greater part of cell $Cu_2 + 1A$, where this diffuse dusting may almost reach the semimacular limit. The aurorae are variable, often very rich (S. E. Colorado, Kansas) but in S. California and Arizona a rather distinctive upperside female form is produced by a combination of rich blue overlay on dark ground and blurred, isolated fw. aurorae which are reduced to around 8 scale lines (Cu_1) in both wings.

In the northern western states and in Canada, the underside ground often acquires a smooth greyish fawn shade, with reduced pulvis and rather diffuse cretules, especially in males. In the females the blue overlay is often absent or reduced, the aurorae tend to narrow but they are sharply defined so that blue females do not have the dark blurry look of the Arizona form. Individual females with the auroral band in fw. greatly enlarged, from 15 to 20 scale-lines broad (swamping the semimacular area), occur in Idaho, Utah and elsewhere.

The undersides of specimens from low elevations in Utah and N. and E. California are similar to the northern form but there is an intensification of auroral and macular pigment, and the scintillae are often most brilliant. Intermixed with this form one finds intergrades with the alpine *annetta* and also a whitish form, with bright orange, isolated, but proximo-distally well extended aurorae which differs from *ssp. inyoensis* mainly in heavier terminal markings.

A large, ample-winged, beautiful form collected by Bell, near Fallon, Nevada, has a light, variably tinted underside ground, enlarged macules and isolated aurorae. In the female upperside the auroral band is hypertrophied (attaining 15 sls. in hw. and 25 sls. in fw.), with a straight proximal margin in both wings. The cusps of adjacent aurorae broadly fuse on veins and reach the terminal line. As in females of *inyoensis*, with which these intergrade, the ground is very light, intermixed with fulvous scales (very close to auroral ones) along the veins discally, with a sparse, basal rather light blue dusting. In a few specimens the aurorae are bleached to a creamy white, a pathological phenomenon which occurs also in *ssp. annetta*.

In San Diego, S. California, a small form is common, with a white (grading into *ssp. inyoensis*), whitish grey or greyish fawn (often with the tan effect noted by Chermock in the Gold L. form) underside and not very conspicuous haloes and cretules. The macules are strong and often enlarged, the aurorae cuspless, sometimes well separated, though fairly developed. The females are quite similar to the Arizona form.

Finally there is the Mono Co. and Sierra Co. form (*"fridayi"*) which is larger than the San Diego one, but has the same variable underside ground with dull haloes and cretules. The aurorae are somewhat reduced, especially in specimens with beautifully developed greenish-gold scintillae. The upperside ornamentation of the female varies from reduced aurorae to the enlarged ones of *ssp. inyoensis*, with which this form intergrades although very unlike it in extreme individuals.

It is to be noted that typical *melissa* is *not* the low level (sage belt, oak brush, alfalfa, prairie, etc.) form or forms, with richly ornamented underside and female upperside, but an altitudinal, comparatively drab race, little known to collectors. The low level group is much too intricately connected with other, taxonomically existing, subspecific groups at various points of its enormous though patchy dispersal, to be kneaded into a separate subspecific entity. Therefore, I have connected it with the type race and thus have retained, on the whole, the general concept of *"melissa"*; but it may well happen that further research will necessitate a subspecific segregation of some of the richer forms.

In regard to the hypothetical occurrence of *melissa* Edwards in the Palearctic region, the following should be said. The legend started with Alpheraky determining in 1897 (*in* Romanoff, Mém. Lép., **9**, p. 315) as "*Lycaena Argus* L. (Hübner nec L; *argyrognomon auct.*) *var. Melissa* Edw." a single female specimen taken by Herz, 7.VIII.1890, in Kamchatka (apparently in the vic. of Staryi-Ostrog, judging by Herz's own account, *op. cit.*, p. 289). His determination was based on the specimen having a conspicuously broad auroral band on both wings upperside, unlike any other Eurasian specimen of "*Argus*" in the Romanoff collection but similar to three Californian females which the collection contained. He added that on the underside the Californian specimens and the Kamchatka one were absolutely similar to light colored Central Asiatic and South Russian undersides (which he referred to his "*Argus var. planorum*" = a tangle of *Lycaeides argyrognomon* and *ismenias* forms), and to certain specimens from Persia which he referred to "*Hypochiona* Rambur", now known to be a ssp. of the true *Plebejus argus* (L.) (the "*Aegon*" of Alpheraky), but which probably belonged to another ssp. of *argus* L., namely *orientalis* (Verity). It is evident that no weight can be attached to Alpheraky's identification of a single female specimen which might have belonged to an aurorally well marked form of *Lycaeides argyrognomon* or *ismenias*, or *Plebejus argus* much more readily than to *melissa*.

I have little doubt that as soon as Staudinger's "Katalog" (1901) had, on Alpheraky's authority, and possibly, for its own commercial reasons, given "Kamchatka" as a palearctic locality for *melissa*, some thrifty German dealer affixed this label to American specimens, thus greatly increasing their price. Eventually a pair of these got into the Bavarian State Museum and were solemnly studied by Forster (1938). Seitz (1909) also includes "*var. melissa*" from "Kamchatka" among his palearctic Lycaenids (p. 301, English Ed.) but the extent of his knowledge in regard to *melissa* Edwards can be gauged by his inflicting upon it a "broad black margin."

This seems to settle Kamchatka; but another Russian locality, Sarepta, on the lower Volga, causes more trouble. Chapman described as *Plebeius sareptensis*, 1917, in Oberthür, Et. Lép. Comp., **14**, pp. 42–46, 52–53, Pl. 12, figs. (male genitalia) 34–36, and 1918, Ent. Rec., **31**, pp. 2, 4–5, 7–8, text fig. 7 (androconial scale), a *Lycaeides*, genitalically close to *melissa*, from specimens purported to have been taken by Jones who, travelling with Sheldon (see Sheldon, 1914, Ent., **47**, pp. 233, 269, 293, 315), had found what seems to have been *Lycaeides argyrognomon* (Bergstr., Tutt), 1st brood, common at Sarepta, 20

V.1913, and another species, Chapman's *sarceptensis*, common there in June. It is useless to discuss the matter in detail until Chapman's material is reinvestigated. The collection of A. H. Jones was sold in 1925 (Sheldon, 1925, Ent., **58**, pp. 124–125) and the Lycaenids in question seem to have been in lot 384a.

Lycaeides melissa pseudosamuelis subsp. nov.

Male holotype, prep. 372 (Pl. 1, fig. 28, Pl. 6, fig. 75), allotype (Pl. 9, fig. 120) and 5 male paratypes (preps. 343, 0432, 0433, 0435), vic. Red Mt. Inn, Highway 82, between Mt. Elbert and La Plata, Pitkin Co., Colorado, *leg.* Turner, *ex* ST, M.C.Z.; 2 males, 1 female, paratypes, same data, ST; 2 males (of which one prep. 332) and 2 females (of which one Pl. 6, fig. 76), Lake Co., Colo., 10.VII.1940, *ex* ST, M.C.Z.; a pair, paratypes, same data, ST; male (mentioned as "*Plebeius scudderi kodiak*" by Cross, 1937, Proc. Colorado Mus. Nat. Hist., **16**, p. 22, det. by Huntington), Snowmass L., Pitkin Co., 11,000 ft. alt., 3.VII.1931, *leg.* Brown, prep. 329, A.M.N.H.

Genitalic measurements. 7 males (Pitkin and Lake) showed the range: F...51–64, H...33–43, U...40–49, E...5–6, more or less corresponding to fluctuation in forewing length (1,100–1,450).

Underside components of hindwing cell Cu_1 (in scale-lines)

Holotype, left hindwing. Ground (light fawn with greenish blue dusting)...8. Halo, prox. part...3. Macule (fairly strong)...7. Halo, dist. part...3. Ground...7. Prox. cretule...14. Semimacule (fairly strong, crescentic)...6. Aurora (fairly bright, almost no cusps)...5. Praet. mark (covered almost completely with scintilla consisting of about 100 scales)...15. Term. space...6. Term. line...2. The measurements of the allotype are (right hindwing): 8, 3, 11, 3, 14, 13, 6, 8, 14, 8, 2, with slightly stronger pigmentation.

Description. Differs in both sexes from other Colorado forms in the combination of the following characters: 1. underside ground (light fawn) with conspicuous greenish-blue pulvis in base of both wings, spreading to disc in posterior part of hindwing; 2. underside aurorae in hindwing bright but greatly reduced; in forewing tending to disappear; 3. female upperside aurorae in hindwing reduced to around 5–7 scale-lines in medial extension; in forewing reduced or obsolescent. There is no trace of blue overlay on female upperside, except some dusting in the distal cretules of some specimens.

I am prompted to give this form subspecific status by the following considerations: it is just sufficiently distinct in alar characters to merit such rank; its fixation helps to delimit the geographically adjacent type form of *melissa melissa* on the negative side of its pattern (*ssp. pseudosamuelis* being the weakest of *melissa* races in Colorado, the Fairplay typical form of ssp. *melissa* coming next, and the S. E. Colo. form bringing ssp. *melissa* to its maximum expansion in Colorado); it has been confused in the past with *argyrognomon alaskensis* (*"kodiak"*); and finally it shows a certain resemblance to *argyrognomon sublivens* of S. Colo., a resemblance which suggests further investigation (it is not unlikely that a state of affairs similar to the Jackson Hole tangle may be discovered in S. Colo.).

Lycaeides melissa inyoensis (Gunder)

Pl. 1, fig. 11; Pl. 6, figs. 91–93; Pl. 9, figs. 139–141.

Lycaena melissa Wright, 1906, Butt. W. Coast, p. 225, figs. 379, male (Greenhorn Mts., 1,700 ft. alt., Kern Co., California, VII.1888), 379b, female (San Bernadino Valley, 1895, *trans. ad. ssp. melissa*), 379c, female underside (Mojave Desert, 3,000 ft. alt., 12.VIII.1887), all taken by Wright. Seitz, 1922, Grossschmett. Erde, **5**, pl. 144, row f (poor copy from Wright, 1906).

Plebeius melissa lotis McDunnough, 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, p. 111 (except lines 12–13), Kern Co., Calif. (Havilah and Tehachapi), "apparently quite rare", Pl. 11, fig. 12, male underside. Gunder, 1930, Bull. S. Calif. Acad. Sci., **29**, p. 82, Los Angeles Co. (Bouquet Canyon and Sandberg's, *leg.* Ingram and Malcolm). J. A. Comstock, **1927**, Butt. Calif., p. 183, at times very common in Tehachapi Mts., Pl. 53, figs. 23, 24, male both sides, Bouquet Cn., 3.VI.1923, fig. 25, female, same data; 1928, Bull. S. Calif. Acad. Sci., **27**, fig. 66, ovipos. on and near base of lupine (Bouquet Cn.), Pl. 5, figs. a, b, ovum.

Plebeius melissa transition form *inyoensis* Gunder, 1927, Can. Ent., **59**, pp. 281–282, Pl. A, fig. 1, male underside, holotype (aberrational fusion of discal macules with semimacules), Olancha, Inyo Co., S. Calif., 2.VII.1925, *leg.* Malcolm.

Lycaena lotis Holland, 1931, Butt. Book, p. 264 (habitat incorrectly copied from Comstock, 1927, *v. supra*), Pl. 66, figs. 18, 20, male both sides, 19, female (*trans. ad. ssp. melissa*?).

Lycaeides melissa lotis Stempffer, 1933, Bull. Soc. Ent. France, **38**, p. 110, Bouquet Cn., Calif.

Plebeius lotis Macy and Shepard, 1941, Butt., p. 173.

Lycaeides melissa, form 3, Nabokov, 1944, Psyche, for 1943, **50**, pp. 95–97, added Lebec, Kern Co., and Arrowhead, Bernardino Co.

Plebeius melissa paradoxa Chermock (*pro parte*), 1945, Can. Ent., for 1944, **76**, p. 214, S. Calif. (Tehachapi Mts. and Lebec, Kern Co.; Bouquet Cn., Los Angeles Co.; Fillmore, Ventura Co.).

It is a pity to have to use a name originally meant to designate an aberration, but I do not see how one can adopt any other course under the present rules. This subspecies had been confused with *Lycaena lotis* Lintner until I separated it in 1944. Incidentally I doubt that Chermock (1945) dissected specimens of Lintner's form when erecting his *melissa paradoxa*. A pair of his "true *lotis*" (*l.c.*), which he kindly sent me, turns out to belong to the ordinary N. Californian form of *melissa* and thus has nothing to do with *argyrognomon lotis* (Lintner).

Specimens examined. All from S. California. From Inyo Co.: Olancha, Owens L., VI.1917, *leg.* Pilate, *ex* coll. Fall, M.C.Z., of which male, Pl. 1, fig. 11, Pl. 6, fig. 91, and female, Pl. 9, fig. 140; Round Vy., 5,000 ft. alt., 17.VIII.1929, H, A.M.N.H. From Kern Co.: Havilah, 10.VI.1919, *leg.* Grinnell, *ex* coll. Fall, M.C.Z.; Tehachapi, 15.VII.1918, H, A.M.N.H. and M.C.Z., of which male, Pl. 6, fig. 92, female, Pl. 9, fig. 141; Lebec, CM, HC, A.M.N.H., ST, of which male 18.VII.1937, Pl. 6, fig. 93. From Los Angeles Co.: Elizabeth L., 3,000 ft. alt., dG and H, A.M.N.H., M.C.Z., Ac.N.H.Phila., of which female, 14.V.1916, Pl. 9, fig. 139; Bouquet Canyon, Ac.N.H.Phila., HC, M.C.Z.; Sierra Madre, 10.VI.1912, *leg.* J. A. Comstock, Ac.N.H.Phila. From Mono Co.: Mono L., 15.VII.1932, *ex* coll. Wood, *ex* A.M.N.H., M.C.Z.

Genitalic measurements. 6 males (Olancha; Havilah; Tehachapi, Lebec, Eliz. L.) showed the range: F...55.5–62, H...35.5–40, U...43.5–49, E...5–7.

Underside components of hindwing cell Cu_1 (in scale-lines)

Olancha, left hindwing of male. Ground (almost white)...10. Halo (this and the cretule hardly distinguishable on the pale ground), prox. part...3. Macule (rather weak)...8. Halo, dist. part...3. Ground...0. Prox. cretule...15. Semimacule (rather weak)...4. Aurora (fairly bright, no cusps, isolate)...12. Praet. mark (rather weak, with scattered scintillant scales)...11. Term. space...8. Term. line...2 (hardly rising at all on veins).

The wings tend to be rather long and pointed in both sexes. The male underside characters are: a powdery whitish ground; fairly strong but often reduced macules; rather weak semimacules; short to

long (reaching 15 sls. in Cu_1, hw.), rather light orange aurorae devoid of cusps and well separated from each other; reduced praeterminal marks; and, finally, very weak, or practically absent, triangles on the veins, in result of which the narrow but distinct terminal line rims the margins very clearly and evenly. Specimens with obsolescent maculation which occur now and then are very like obsolescent specimens of *ssp. annetta* (except in shape), a phenomenon paralleling the one discussed under *arg. ricei*. In the female underside the ground has often a creamy or yellowish cast, with indistinct haloes and cretules, and the aurorae are sometimes fuller, but undersides quite similar to male ones are frequent. In what I consider the extreme, and taxonomically most typical, upperside female form, the rather light, silky violet blue varies from "basal" to "maximum" on a weak fuscous ground with auroral intermixture. The upperside aurorae in both wings fuse into warm orange bands with the cusps tending to reach the terminal line and with a more or less straight inner margin which in the fw. is rather diffuse. The general aspect (sometimes on *both* surfaces) bears a striking homoptic resemblance to the sympatric (at least inKern Co.) *Plebulina emigdionis* (Grinnell). The auroral bands vary in breadth from quite narrow to very broad, often overflowing proximad beyond the semimacular limit, and specimens with little or no blue dusting occur among the most brilliant ones.

Lycaeides melissa annetta (Edwards)

Pl. 1, fig. 13; Pl. 6, figs. 87–90; Pl. 9, figs. 33–35.

Lycaena anna Graef, 1875, Can. Ent., **7**, p. 98, Salt L., Utah Territory (this ssp. or ssp. *melissa*?).

Rusticus anna Scudder (*pro parte*), 1876, Bull. U. S. Geol. and Geog. Surv., **2**, p. 270, Wasatch Mts., Utah (American Fork Canyon); 1877, Bull. Buffalo Soc. Nat. Sci., **3**, p. 122, adds Colorado (extreme north-west?).

Lycaena annetta (Mead *in litt.*) Edwards, 1882, Papilio, **2**, pp. 48–49, Salt L. (*leg.* Mead, 1878). Holland, 1898, Butt. Bk., pp. 266–267, Pl. 32, figs. 13, 14, both sexes. Browning, 1901, Ent. News, **12**, p. 299, above Salt L., 7,000 ft. alt., one specimen. Snyder, 1901, *ibid.*, p. 302, vic. Park City, Ut. (Deer Meadow, common). Seitz, 1922, Grossehm. Erde, **5**, pl. 144, row g (poorly copied from Holland, 1898). Holland, 1931, Butt. Bk., rev. edit., p. 264, "thus far only known from the Salt Lake Valley" (Mead's specimens were certainly taken above the "Valley"), Pl. 32, figs. 13, male, type (should be checked), 14, female, type, Pl. 66, fig. 16, male underside, "type" (cotype, not obsolescent enough to conform with O.D.).

Lycaena annetta forma parvipuncta (*nom. praeocc.*) Courvoisier, 1912, Iris, **26**, p. 63, N. Amer.

Plebeius scudderi geog. race *annetta*, Barnes and McDunnough, 1917. Check List Lep. Bor. Amer., p. 16.

Lycaeides argyrognomon exerge *annetta* Verity, 1931, Iris, **45**, p. 34.

Lycaeides melissa (local form 4) *annetta* Nabokov, 1944, Psyche, for 1943, **50**, p. 97, Wasatch Mts. (vic. Alta Lodge).

Specimens examined. Utah. Numerous specimens from Alta, Wasatch Mts., 8,500–9,000 ft. alt., 12.VII–20.VIII.1943, *leg.* V and D. Nabokov, M.C.Z., of these males, Pl. 1, fig. 13, Pl. 6, figs. 87, 89, 90, females, Pl. 6, fig. 88, Pl. 9, figs. 133–135. Other specimens from Twin L., above Brighton, Wasatch Mts., 9,000 ft. alt., 13.VIII.1943, *leg.* V. and D. N., M.C.Z. A pair from Park City, male *leg.* Spalding, 1895, female *leg.* Skinner, both Ac.N.S.Phila.

Genitalic measurements. 10 males (Wasatch Mts.) showed the range: F...62–68, H...41–45.5, U...43–49, E...5.5–7.5. The tendency (quite unusual for the species) on the part of H to catch up with U is to be noted. The resulting mean (65, 43, 45, 6.5) is interesting to compare with the mean of *ssp. samuelis* (56, 37, 46, 5.5), where the shortness of H is particularly well marked. That this altitudinal subspecies with an almost pathological reduction in wing pigmentation should have the highest intraspecific F (and a well developed wing shape) is most curious. I suggest that it has arisen from *argyrognomon* with a later admixture of *melissa melissa* blood.

Underside components of hindwing cell Cu_1 (in scale-lines)

Alta, Ut. Left hindwing of well-marked male. Ground (almost white)...9. Halo, prox. part...3. Macule (rather weak)...6. Halo, dist. part...3. Prox. cretule (blending with ground)...27. Semimacule (weak)...4. Aurora (fairly bright, cuspless, isolate)...8. Praet. mark (weak, with pale scintilla)...10. Term. space...10. Term. line...1 (rising to 3 on veins). Compare these argyrognomoid measurements with those of the Salt Lake City *melissa melissa*.

Alta, Ut. Left hindwing of poorly marked male (taxonomically typical). Ground (whitish)...23. Macule with halo...0. Prox. cretule...25. Semimacule (weak)...3. Aurora (very weak, pale yellow, with pale scintillant interpolation distally, no cusps)...6. Praet. mark (weak, with pale scintilla)...10. Term. space...6. Term. line...1 (rising to 3 on veins).

As in *argyrognomon ricei* there are various intergradations between comparatively well marked undersides and "fade outs".

Well marked underside: ground greyish white to almost pure white with some rather conspicuous turquoise pulvis basally in both wings; macules of average size and pigmentation; stretch from halo to semimacule longer than in other races of the species; cretules (when distinguishable) long in both wings; semimacules and praeterminal marks reduced in both wings; the interval between them reduced also, with quite short, cuspless, isolated, orange aurorae in hw. and in the strong cells of fw. The shortness of the aurorae, the tendency to an ampler wing margin and the presence of small but fairly conspicuous prox. triangles, even when the term. line disappears, distinguish this form from ssp. *inyoensis*. In the female, the markings and the ground are generally stronger than in the male, but identical undersides belonging to different sexes can be picked out.

The weak undersides are very variable: 1. The discal macules are reduced to mere dots and gradually disappear altogether; 2. the semimacules may disappear too; 3. the pigment of the praet. marks may do likewise; 4. the aurorae melt to a pale yellowish tone but never quite vanish; 5. the auroral interval is still more reduced. These five tendencies do not necessarily coincide (any of the last four can coincide either with well marked or immaculate disc, while the latter may coincide with well defined semimacules, etc.). In passing through these various stages and combinations, the color and pattern may produce remarkable homoptic resemblances to forms of *argyrognomon scudderi*, *argyrognomon anna*, and *argyrognomon ricei* (in the latter the fading out process is more complete at its extreme limit). It should be noted that the immaculate disc form is the male type of Edwards' *Lycaena annetta*. Such extreme specimens (of both sexes) occur at the ratio of about 1 to 20 in one colony, so far as my own observations go.

The following upperside female forms are represented in my material: 1. The strongest form of the subspecies. The aurorae of both wings, though richly pigmented, are shorter than in *melissa melissa* of low altitudes in Utah and tend to be disconnected. The cusps are variable. There is some violet blue dusting over the brown ground and the hw. praeterminal insulae are made conspicuous by the presence of whitish or bluish distal cretules; 2. Same as 1, but with fw. aurorae obsolescent; 3. Bleached aurorae occur in 1 and 2, on a rather weak ground, the latter with a "grey-blue" effect due to a sparse overlay. A similar form occurs among individuals of a large Nevada *melissa melissa* form. The fact of this happening both in sagebrush surroundings and at high altitudes seems to preclude a direct environmental cause for this albinistic tendency; 4. Aurorae light colored,

intermediate between bright and bleached; 5. The presence of whitish, more or less sagittate, proximal cretules in both wings, with a tendency to be especially pronounced and elongated in the radial cells. All combinations and intergradations between these five forms occur. The taxonomic type form is a very striking combination (see figs. 134 and 135) of more or less bright (almost red in the prettiest specimens) aurorae, light ("silky") blue overlay dusting the weak ground throughout, long whitish proximal cretules and light bluish or pure white distal ones.

This exceptionally interesting subspecies was very little known, when I came across it in the Wasatch Mts. in July 1943. I was assisted in its rediscovery by my son Dmitri, then aged 10. It was extraordinarily local, being found only in small colonies for about a mile or so on both sides of the Little Cottonwood River, between 8,500–9,000 ft. alt., at Alta. Nothing of it was seen on the various hillsides investigated on the other side of the highway, but one colony was found beyond the Pass, above Brighton. In all instances its habitat was characterized by clumps of Douglas fir, ant-heaps (*Formica sanguinea subnuda* Emery) and an abundant growth of *Lupinus parviflorus* Nuttall (which is the foodplant of the likewise poorly pigmented local form of *Glaucopsyche lygdamus*). It had one protracted generation from at least mid-July to at least the end of August. Once, among a colony of fresh ssp. *annetta* individuals of both sexes, I took a single very faded female specimen of the oak-scrub form of ssp. *melissa* which had certainly wandered up from the valley. Such wandering females are presumably responsible for the intergrades (some such *ssp. melissa* looking specimens are mentioned under that *ssp.*) which now and then occur among typical *annetta*. By hiking some fifteen miles daily I satisfied myself that neither *melissa* nor *annetta* were present between 6,000 and 8,500 ft. alt. along the canyon. Below, in the oak-scrub and sage-brush belt, a smallish form of *ssp. melissa* was common here and there, in at least two generations, and in obvious association with *Hedysarum boreale* Nuttall growing along the roads.

Lycaeides melissa samuelis Nabokov

Pl. 1, figs. 14–16; Pl. 6, figs. 77, 78; Pl. 9, figs. 121–125.

Lycaena scudderi Saunders, 1862, Can. Nat. and Geol., **7**, pp. 132, 398, S. Ontario, vic. London (from the cemetery to the Great Western Railway track and along the line for about ¼ mile, early VI and again in VIII, very common in 1861). Edwards (*pro parte*), 1863, Proc. Acad. Nat. Sci.

Philadelphia, **1862**, p. 225, female, *leg.* Saunders, *v. supra.* Lintner, 1872–74, 23d Rpt. N. Y. State Mus., **1869**, pp. 45, 50, 24th *op. cit.*, **1870**, pp. 58–59, 26th *op. cit.*, **1871**, p. 178, New York (Center, now Karner, pine-barrens between Albany and Schenectady), late V to late VI, mid VII to late VIII, 1869–1871, abundant, males of 2d brood settling on patches of damp ground. Edwards, 1873. Trans. Amer. Ent. Soc. Philadelphia, **4**, p. 348. Möschler (*pro parte*), 1874, Stettin, Ent. Ztg., **35**, p. 156, female, Pennsylvania. Strecker (*pro parte*), 1874, Lep., p. 87, "New England States" and Michigan. Bailey, 1877, Can. Ent., **9**, pp. 117, 119, describes the Center, N. Y., locality (south side of railroad and both sides of road to Sloans). Saunders, 1878, Can. Ent., **10**, pp. 14–15, describes larva found in the London, Ont. locality, 22.VII.1867, on *Lupinus perennis* Richard, pupal stage 28.VII to 8.VIII. Lintner, 1878, 30th Rpt. N. Y. State Mus., **1876**, pp. 169–170. Worthington, 1880, Can. Ent., **12**, p. 48, N. Illinois. Edwards, 1884, Can. Ent., **16**, p. 84, adds (in error) *Ceanothus americanus* Linn. as foodplant. French (*pro parte*), 1886, Butt. U. S., p. 286, adds Wisconsin (*teste* Hay?). Beutenmüller, 1893, Bull. Amer. Mus. Nat. Hist., **5**, pp. 284–285, vic. New York City, very rare, *leg.* Elliot; Pl. 5, fig. 12, female. Gibson, 1898, 28th Ann. Rpt. Ent. Soc. Ontario, **1897**, p. 75, vic. Toronto, mid VI (1st gen.). Holland (*pro parte*), 1898, Butt. Bk., pp. 265–266, adds Catskill Mts. and Saratoga, N. Y.; Pl. 30, fig. 48, male, fig. 49, female; Pl. 5, fig. 41, pupa (poorly copied from Scudder, 1889). Fiske, 1898, Ent. News, **9**, p. 43, New Hampshire (vic. Webster), one worn female, 6.VI.1896. Scudder (*pro parte*), 1901, Ottawa Nat., **15**, p. 121. Lyman, 1902, Can. Ent., **34**, pp. 126–128, vic. Toronto (High Park, sandy soil, lupine), 10.VIII.1898; larvae 15.V.1899, pupated late V and early VI. J. B. Williams, 1903, Can. Ent., **35**, p. 187, female pupa attached to underside of old boot lying in grass, with ant in attendance, High Park, vic. Toronto, late V.1902. Longley, 1905, Ent. News, **16**, p. 126, N. W. Indiana (Hessville). Kwiat, 1908, Ent. News, **19**, p. 421, vic. Chicago (Hartman Farm, sandy ridge, lupine), 30.V.1908. Stamm, 1911, Ent. News, **22**, p. 422, E. Pennsylvania (Montour Co.), *leg.* Meredith. Seitz, 1922, Grossehmett. Erde, **5**, Pl. 155, row f, male, female and underside. Forbes, 1926, in Leonard, List Ins. N. Y., p. 681, adds Adirondack Mts. and Clayton. Holland, 1931, Butt. Bk., rev. edit., Pl. 66, fig. 12, male underside (from N. Y.; see Nabokov, 1944, p. 98, footnote), "type" (*false*). Cadbury (*pro parte*), 1938, Proc. Acad. Nat. Sci. Philadelphia, **89**, p. 412, vic. Albany, N. Y.

Lycaeides scudderii Scudder (*pro parte*), 1872, 4th Ann. Rpt. Peabody Acad. Sci., **1871**, p. 54, congeneric with *Papilio argus* (Hübner, 1823, *nec* Linnaeus, 1758).

Rusticus scudderii Scudder (*pro parte*), 1877, Bull. Buffalo Soc. Nat. Sci., **3**, p. 122. Scudder, 1888, Psyche, **5**, p. 13, reared on lupine from eggs laid by 1st gen. females, Center, N. Y., 1887. Scudder (*pro parte*), 1889, Butt. New England, **2**, pp. 964–969, adds Brooklyn, N. Y. (coll. Akhurst *teste* Edwards) and Toronto, Ont., (*leg.* Fletcher); *op. cit.*, **3**, Pl. 6, fig. 6, male

(holotype of *samuelis* Nabokov, 1944), fig. 7, female, both sides; Pl. 34, fig. 29, male genit.; Pl. 39, fig. 19, neuration; Pl. 46, fig. 29, androconium; Pl. 55, fig. 7, parts of body; Pl. 65, fig. 13, ovum; Pl. 71, fig. 4, Pl. 75, figs. 36, 38, Pl. 79, figs. 32–35, Pl. 86, fig. 14, larva; Pl. 84, fig. 41, pupa. Howard, 1909, in Smith, Century Dictionary (Suppl.) **11**, p. 147. J. H. Comstock, 1925, in Comstock and Comstock, Butt. Eastern U. S., pp. 246–247, Pl. 37, fig. 4, underside, fig. 5, male, fig. 6, female.

Plebeius scudderi Chapman, 1909, in Tutt, Brit. Butt., **3**, expl. of Pl. 50, fig. 4, end of valve. McDunnough (*pro parte*), 1916, in Barnes and McDunnough, Contrib. Nat. Hist. Lep. N. Amer., **3**, p. 110. Montgomery, 1931, Proc. Indiana Acad. Sci., **40**, p. 354, Lake Co., Indiana. Moore, 1939, Occas. Papers Mus. Zool. Univ. Michigan, No. 411, p. 18, W. Mich. (counties: Allegan, Muskedon and Newaygo).

Plebeius melissa Chapman, 1917, in Oberthür, Et. Lep. comp., **14**, p. 42, Pl. 9, fig. 26, male genit., Toronto; 1918, Ent. Rec., **30**, p. 4, Toronto.

Lycaeides argyrognomon (Bergsträsser, Tutt) exerge *scudderi* Verity, 1931, Iris, **45**, p. 34.

Lycaeides melissa ssp. samuelis Nabokov, 1944, Psyche, for 1943, **50**, pp. 97–99, holotype, *ex* coll. Scudder (Center, N. Y.), allotype, *id.*, Albany (Center, N. Y.), adds Nashua, N. H. (*leg.* W. P. Comstock), Sylvania, N. Ohio (*leg.* D. Eff), Detroit, Mich., and Massachusetts; 1945, Psyche, for 1944, **51**, p. 109, text fig. 1, MEL, uncus of holotype.

In perusing the above synonymy it should be kept in mind that Edwards described as "*Lycaena scudderii*" three different species: in 1861 the male of *Lycaeides argyrognomon scudderi* (Edwards), *q.v.*, a member of the short-falced holarctic species; in the same year and paper the female of *Agriades glandon aquilo* (Boisduval, 1832), as ascertained by me, in 1944, from Edwards' description; and finally in 1863 the female of what is now known as *Lycaeides melissa samuelis* Nabokov, 1944, a member of the long-falced nearctic species. The confusion, which was started by Edwards misidentifying the captures of Saunders and Lintner, lasted for more than eighty years, except that McDunnough in 1915 (in Anderson, Proc. Ent. Soc. Brit. Columbia, **1915**, p. 126) and Blackmore in 1920 (*op. cit.*, Syst. Ser. **14**, p. 7) expressed some vague doubts as to the "Eastern form" being the "true *scudderi*."

Specimens examined. From vic. Albany (Karner, formerly Center), N. Y., holotype and allotype, SCD, M.C.Z., and the following 61 paratypes: 6 males, 2 females, SCD, M.C.Z.; male, 1.VI.1869; pair, VI.1876, *leg.* Bailey, all three *ex* coll. R. M. Grey (of these female, Pl. 9, fig. 122), M.C.Z.; 2 pairs (of which male, Pl. 6, fig. 77, *ex* A.M.-N.H., M.C.Z.), 17.VI.1927, *leg.* Huntington, A.M.N.H.; 4 pairs, 21–25.VII.1934, *leg.* Frederick, A.M.N.H.; 22 males, 12 females, of which

male, 10.VII.1908, 2 males, V.1933, *leg.* Rupert, and the rest V–VIII.1934–1941, *leg.* Frederick (of which male, 25.V.1941, Pl. 1, fig. 15, and female, 25.VII.1938, Pl. 9, fig. 121, *ex* HC, M.C.Z.), HC; male, 25.VII.1938, ST; and 2 males, 1 female, *ex* coll. Eddy, M.C.Z. From elsewhere the following 26 paratypes: pair, Pennsylvania, *ex* coll. Fall, M.C.Z.; male, Massachusetts, *ex* coll. Angus, A.M.N.H.; 2 females, Mass., *ex* coll. Hy. Edwards, A.M.N.H.; male (Pl. 1, fig. 16) and 2 females (of which one Pl. 9, fig. 125), Nashua, New Hampshire, 14–23.VIII.1907, *leg.* W. P. Comstock (the figured pair in M.C.Z.); 8 males (6 in ST; 2 in TF, incorrectly listed as "pair" in orig. descr.), Sylvania, N. Ohio, 19–24.VII.1940, *leg.* Eff; female, Detroit, Mich., M.C.Z.; pair, Hess Lake, Mich., 24.VII.1938, *leg.* McAlpine, TF; female, Canada (London, Ont.), *leg.* Saunders (1861), SCD, M.C.Z.; male (Pl. 1, fig. 14) and female, Toronto, Ont., 4.VI.1898, *leg.* Gibson, TF; and from same locality, *leg.* Corfe, 2 pairs, ST (of which one male, prep. 677, with fused falces at elbows, a unique monstrosity, and the other, 12.VIII.1920, Pl. 6, fig. 78). Other specimens: male, female (Pl. 9, fig. 124), Wayne Co., Penna., *ex* coll. Snow, *ex* Ac.N.S.Phila., M.C.Z.; 3 males, Manchester, New Hampshire, *ex* coll. Skinner, Ac.N.S.Phila.; and female, High Park, Toronto, 2.VIII.1903, *leg.* Hahn, M.C.Z.

Genitalic measurements. 12 males (Karner, N. Y., Nashua, N. H., Sylvania, Ohio, Toronto, Ont.) showed the range: F. . .51–61, H. . .32–42, U. . .43.5–50, E. . .5–7.

Underside components of hindwing cell Cu_1 (in scale-lines)

Holotype, *vic.* Albany, left hindwing underside. Ground (greyish fawn). . .10 Halo, prox. part. . .2. Macule (fairly strong). . .9. Halo, dist. part. . .3. Ground. . .14. Prox. cretule. . .7. Semimacule (fairly strong). . .8. Aurora (bright; no neural cusps). . .7. Praet. mark (fairly strong, with proximally placed scintilla and some auroral interpolation in first three lines). . .12. Term. space. . .5. Term. line. . .2 (rising to 4 on veins). Another male measured, from W. Michigan, proved almost identical, with stronger terminal markings.

In regard to wing shape it is interesting to compare this subspecies with *melissa melissa.* In the following measurements the first scale-line number shown for the termination of each vein refers to a smallish Albany male of *ssp. samuelis,* while the second number (in parenthesis) refers to a normal male of *ssp. melissa* from Alma, Colo.

Forewing: R_4 ends at scale-line 162 (162), M_1 at 176 (169), M_2 at 171 (162), M_3 at 165 (155), Cu_1 at 160 (144), Cu_2 at 150 (135) and 2A at 136 (121). Hindwing: Sc ends at 90 (90), Rs at 128 (115),

M_1 at 142 (134), M_2 at 146 (137), M_3 at 139 (135), Cu_1 at 129 (129), Cu_2 at 116 (120), 2A at 96 (110).

Thus in the forewing the less pointed apex of *samuelis* is expressed by 162 — 176 as against 162 — 169 of the typical subspecies. The ampleness of the cubital terminal region is expressed by 165 — 160 as against the typical (155 — 144) straight, proximo-dorsad slanting termen. Larger forms of ssp. *melissa* with well developed forewing are intermediate in shape between the typical form and ssp. *samuelis*. In the hindwing the ampler high-angled termen of *samuelis* is expressed by 90 — 128 — 142 — 146 — 139 as against the typical average-shaped termen 90 — 115 — 134 — 137 — 135. The *samuelis* wing measurements are very similar to those of *annetta* (*v. supra*) in specimens of the same size. In females the difference between the ample shape of *samuelis* and pointed wings of *melissa* is still more striking, especially in the hindwing measurements.

On the underside the smooth greyish fawn ground with inconspicuous basal pulvis, the distinctly haloed, average-sized, strongly pigmented discal macules, the reduced semimacules and short, cuspless, but fairly bright aurorae (which are often, say in 35 out of 40 specimens from the same colony, absent in fw.), and last but not least, the absence of fw. cretules and the shortness of the very much reduced crescentic hw. ones, all this, combined with an ampler outline, especially in hw., and a remarkable upperside in the female, produces a quite constant subspecific aspect, without any intermediate forms to fill the distinct gap in alar characters between this subspecies and *melissa melissa* from Manitoba or the Dakotas. In the average female fw. the bright purplish blue overlay very evenly covers the M cell of RM and the surface dorsad from base to just beyond the disco-macular limit and is rather more sharply outlined on the dark fuscous ground than in other blue forms of the species; in the hw. the blue invades the whole of RM and the posterior part of the wing from base to the semimacular limit, with the neural vadosae more or less distinct. In two specimens the blue is also represented in the discal part of the anterior cells of fw. In a few specimens the overlay is sparse, but only in one (stunted) specimen (fig. 121) is it almost absent. The rest of the markings are: fairly bright crescentic aurorae more or less clearly defined in hw. but absent in fw.; rather conspicuous discoidal insulae in both wings and rather large praeterminal ones in hw. In about half of my specimens violet blue distal cretules enliven the terminal space.

This mysteriously constant subspecies seems to occur only east of the Mississippi, between latitudes 41° and 44° (I doubt whether the N. Carolina record of "*Lycaena scudderi*" reported by Brimley, 1923,

Ent. News, **34**, p. 113, to have been taken by Sherman at Blantyre, V.1908, refers to a *Lycaeides*). It is sharply cut off from the western bulk of *melissa* (the most eastern stations of which are in S. Manitoba, Minnesota and Iowa). It is found in isolated colonies, and only in association with lupine (thus on sandy soil), here and there along the S. E., S. and possibly S. W. shores of L. Michigan, at the western end of L. Erie and at both ends (if not extinct in the western one) of L. Ontario. It patchily follows the Hudson (being still plentiful in its old haunts near Albany); occurs, or occurred, in N. E. Pennsylvania, and is recorded in a very few specimens from the Merrimac, N. H. (where, however, I searched for it in vain in the summer of 1946). Owing to various causes (building, farming, fires, etc.) old colonies die out, while new ones founded by wandering females in quest of lupine, may not always thrive beyond one season. The Massachusetts' records (Merrimac R.?) have never been repeated, and despite Holland's absurd assertion that this is the "commonest member of the group", its distribution remains as imperfectly known as it was in Scudder's day.

CONCLUSIONS

Having examined the forms of *Lycaeides* found in North America, we can now compare their variational range by placing the mean measurements (in 1/100 mm. units) of the falx and uncus according to the length of the forearm. The first nine subspecies belong to *argyrognomon* (Bergstr., Tutt), the last five to *melissa* (Edw.). The tenth, although taxonomically assigned to *argyrognomon*, includes transitions between the latter and *melissa*.

	F	H	U	E
aster	38	30.5	30	6
ricei	39.5	32.5	31	9
alaskensis	40	32.5	29.5	7.5
anna	40	34.5	33	9
lotis	40.5	33.5	34.5	7
atrapraet	42.5	32	33	7
ferniensis	43	33	32.5	7
scudderi	43	33	33.5	7.5
sublivens	48.5	36	35.5	7
longinus	53.5	38.5	39.5	7
samuelis	56	37	46.5	6
pseudosam	57.5	38	44.5	5.5
melissa	58	38	43.5	5.5
inyoensis	58.5	37.5	46	6
annetta	65	43	45	6

In regard to the alar characters displayed by nearctic *argyrognomon* and *melissa*, certain specific tendencies can be distinguished, despite the fact that both species go through much the same racial aspects (from pale, poorly marked, to dark, strongly marked forms). The *argyrognomon* range in forewing length, from the Maritime Provinces races to those of California, is one or two mm. wider at either limit than it is in *melissa*. In shape the *argyrognomon* hindwing tends to be high-angled and strongly developed (in comparison to the forewing especially), while in *melissa* it tends to be shorter and rounder than in the other species, with, on the whole, less ground-space between the pigmentary components of the cells. The male upperside in *argyrognomon* tends to be more infuscated than in *melissa*, with the *argyrognomon* forewing vadum attaining racially as much as 15–20 sls., whereas in *melissa* the forewing vadum is generally very thin and only in one (individual) case attains an extension of some 10 sls. Though the underside ground color of both species goes from white through greyish and fawn to brown, at the fawn stage a more even and vivid tone seems to be associated with *melissa* rather than *argyrognomon*. The male underside aurorae, which may be obsolescent in either species, are seldom strong in *argyrognomon* where they hardly attain 10 sls. in the critical cell (with a mean of 5); in *melissa* they attain a greater development in richness of pigment as well as in medial and neural extension, with a medial range reaching as much as 17 sls. in the critical cell (with a mean of 8). Finally only in *argyrognomon* is the minimum of female upperside ornamentation attained (no trace of aurorae) while only in *melissa* is the maximum (hypertrophied auroral bands) found.

PLATES

PLATE 1

PLATE 1

Magnification of original x 34

Male genitalia (uncus lobe and falx, ventral view)

Figs. 1, 2. *Lycaeides argyrognomon ricei* (Cross), Mt. Rainier, Wash., and Vancouver Isl., B. C.

Fig. 3. *L. a. alaskensis* (Chermock), McKinley, Alaska.

Figs. 4, 5. *L. a. scudderi* (Edwards), Laggan, Alb., and Saskatch R.

Figs. 6, 7, 8. *L. a. aster* (Edw.), E. Que., Newfoundland (topotype) and Baddeck, N. S. (form "*empetri*").

Figs. 9, 10. *L. melissa melissa* (Edw.), Alma, Colo., and Fallon, Nev. The first shows the measurements used in the text.

Fig. 11. *L. m. inyoensis* (Gunder), Owen's L., Calif.

Fig. 12. *L. m. melissa* (Edw.), small specimen, San Diego, Calif.

Fig. 13. *L. m. annetta* (Edw.), Alta, Utah.

Figs. 14, 15, 16. *L. m. samuelis* Nabokov, Toronto, Albany and Nashua, N. H.

Fig. 17. *L. a. anna* (Edw.), left, and *m. melissa*, right, Gold L., Calif.

Fig. 18. *L. a. lotis* (Lintner), l., and *m. melissa*, r., Mendocino.

Figs. 19, 20, 21. *L. a. ricei* (Cross), l., and *m. melissa*, r., the first set, Fort Klamath, Or., the second, Brewster, Wash., the third, S. Brit. Col.

Fig. 22. *L. m. melissa* (Edw.), Okanagan Falls, S. Brit. Col.

Fig. 23. *L. a. scudderi* (Edw.), l., and *m. melissa*, r., Riding Mts., Manit.

Fig. 24. *L. a. ferniensis* (Chermock), l., and *m. melissa*, r., Didsbury, Alb.

Fig. 25. *L. a. atrapraetextus* (Field), l., and *m. melissa*, r., N. Id.

Fig. 26. *L. a. ssp.*, l., and *m. melissa*, r., Boise and Kuna, Id.

Fig. 27. *L. a. sublivens* Nabokov, l., and *m. melissa*, r., Telluride and Mt. Ouray, S. W. Colo.

Fig. 28. *L. pseudosamuelis* Nabokov, Red Mt. Inn, Colo.

Figs. 29, 30. *L. a. ssp.* (close to next), Camp Roosevelt and Mt. Washburn, Yellowstone Park.

Figs. 31, 32, 33. *L. a. longinus* Nabokov, Jackson Hole, Wyo.

Figs. 34, 35, 36, 37. Same, grading into *melissa*.

Fig. 38. *L. m. melissa*, Buffalo, Wyo.

Fig. 39. *L. a. yarigadakeana* (Matsumura), l., and *ismenias praeterinsularis* (Verity), r., Nikko and Mt. Asama, Japan.

Fig. 40. *L. a. kenteana* (Staudinger), l., and *ismenias ssp.*, r., Transbaikalia.

Fig. 41. *L. a. agnata* (Staudinger), W. Sinkiang.

Fig. 42. Unnamed *sp.*, l., and *i. christophi* (Stdgr.), r., Alai, Fergana.

Fig. 43. *L. i. christophi*, dwarf, Samarkand.

Fig. 44. *L. a. acreon* (Fabricius, Forster), l., and *i. euergetes* (Stauder), r., Isaszegh, Hungary.

Fig. 45. *Freyeria trochilus trochilus* (Freyer), Marash, Taurus.

Fig. 46. *Paralycaeides inconspicua* (Draudt), above Lima, Peru (*leg.* Soukup, M.C.Z.). The forewing length of the last two species slightly surpasses that of the Samarkand individual of *christophi*.

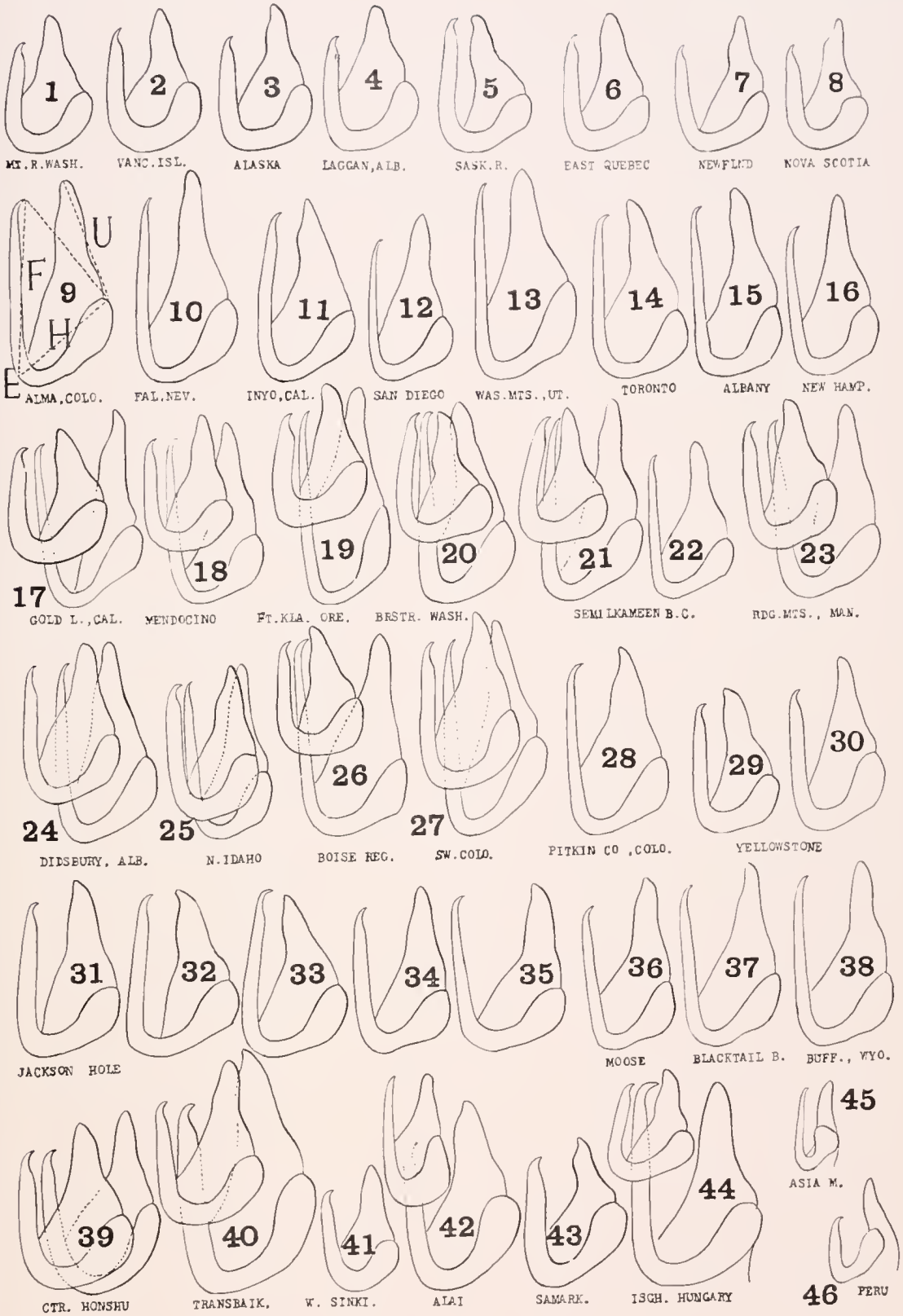

1
MT.R.WASH.
2
VANC.ISL.
3
ALASKA
4
LAGGAN,ALB.
5
SASK.R.
6
EAST QUEBEC
7
NEWFLND
8
NOVA SCOTIA
U
F
9
H
E
ALMA,COLO.
10
FAL.NEV.
11
INYO,CAL.
12
SAN DIEGO
13
WAS.MTS.,UT.
14
TORONTO
15
ALBANY
16
NEW HAMP.
17
GOLD L.,CAL.
18
MENDOCINO
19
FT.KLA. ORE.
20
BRSTR. WASH.
21
SEMILKAMEEN B.C.
22
23
RDG.MTS., MAN.
24
DIDSBURY, ALB.
25
N.IDAHO
26
BOISE REG.
27
SW.COLO.
28
PITKIN CO ,COLO.
29
30
YELLOWSTONE
31
JACKSON HOLE
32
33
34
35
36
MOOSE
37
BLACKTAIL B.
38
BUFF., WYO.
39
CTR. HONSHU
40
TRANSBAIK.
41
W. SINKI.
42
ALAI
43
SAMARK.
44
ISGH. HUNGARY
45
ASIA M.
46
PERU

PLATE 2

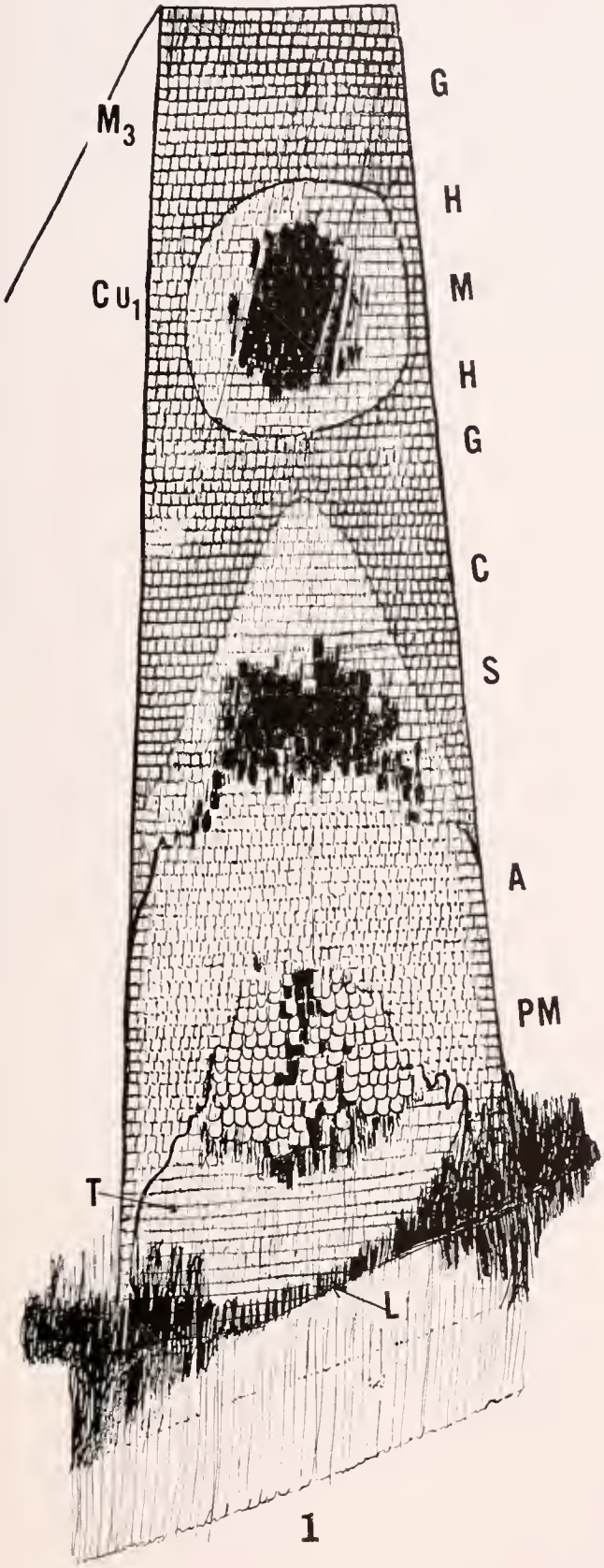
PLATE 2

Magnification of original x 22½

Underside component of hindwing cell Cu_1. The measurements are in scale-lines along the interneural fold from the level of the apex of cell M_3 to the termen.

Fig. 1. Giant race (forewing length 18.5 mm.) of *Lycaeides ismenias* (Meigen) from Chikoy R., Transbaikalia. Right hindwing of male. G, ground...13 scale-lines. H, halo, prox. part...3. M, macule (belonging to discal series)...12. H, halo, dist. part...4. G, ground...5. C, prox. cretule...10. S, semimacule...11. A, aurora (with cusps reaching the prox. triangles on veins)...15. PM, praeterminal mark (with scintillant scales)...14. T, terminal space (within which the dist. cretule is diffused in this genus)...8. L, terminal line...2 (rising to 8 on veins to form the proximal triangles). The distal triangles are on the fringe and point distad. It should be remembered that the semimacule and praet. mark are the proximal and distal portions of a split macule (belonging to limbal series) and that the cretules correspond to the prox. and dist. parts of its (split) halo.

Fig. 2. Dwarf male (fw. length 8 mm.) of *ismenias christophi* (Staudinger) from vic. Samarkand, Turkestan. The corresponding sequence is: 8, 4, 7, 4, 0 (halo and cretule fused), 17, 4, 3, 6, 5, 2.



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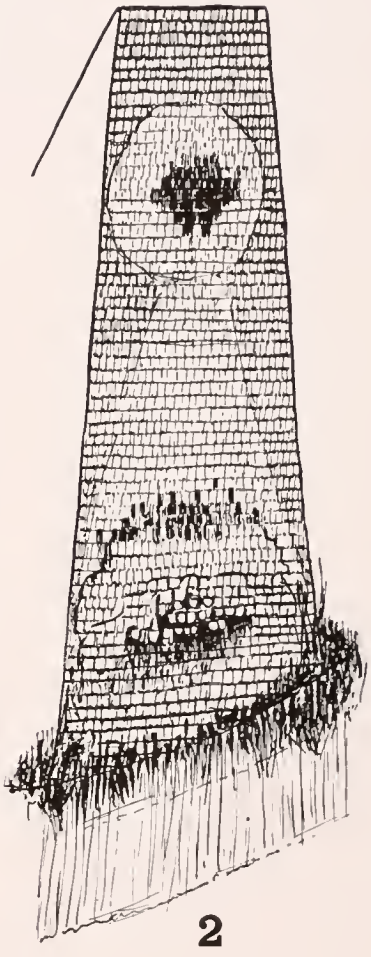


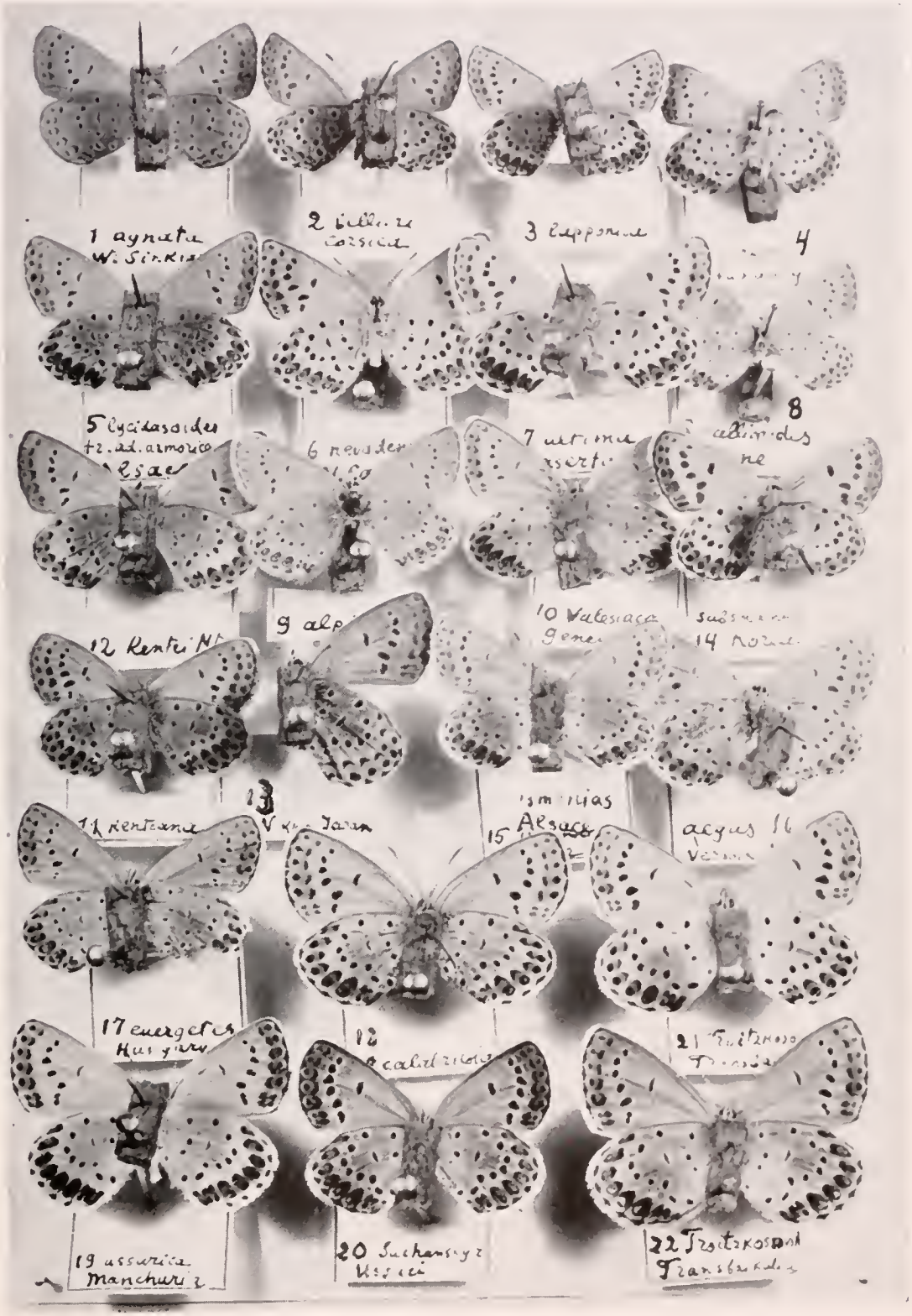
2

PLATE 3

PLATE 3

Male undersides based on M.C.Z. specimens unless otherwise stated

Fig. 1. *Lycaeides argyrognomon agnata* (Stdgr.), Maralbashi, W. Sinkiang.
Fig. 2. *L. a. bellieri* (Oberthür), Corsica.
Fig. 3. *L. a. lapponica* (Gerhard), Lappland, Ac.N.S.Phila.
Fig. 4. *L. a. acreon* (Fabr., Forster), Isaszegh, Hungary.
Fig. 5. *L. a. lycidasoides* Beuret, Alsace.
Fig. 6. *L. a. nevadensis* (Oberthür), Nueva Castilla, Las Lomas 3,000 ft. alt., *leg.* Querci (note basal macule in R, hw., rare in this genus).
Fig. 7. *L. a. ultima* (Verity), Monti de Atina, Caserta, *leg.* Querci, Ac.-N.S.Phila.
Fig. 8. *L. a. calliopides* (Verity, *s. str.*), Digne, Basses Alpes.
Fig. 9. *L. a. alpina* (Bercе, Verity), Alpes (cp. to fig. 38).
Fig. 10. *L. a. valesiaca* (Oberthür, Verity), La Sondon, vic. Geneva, *leg.* Weber.
Figs. 11, 12. *L. a. kenteana* (Stdgr.), Kentei Mts. (cp. fig. 12 to figs. 3 and 5).
Fig. 13. *L. a. yarigadakeana* (Matsumura), Nikko, Honshu.
Fig. 14. *L. a. subsolanus* (Eversman, Hemming), N. Korea, *leg.* Seok.
Fig. 15. *L. ismenias ismenias* (Meigen, Heydemann), close to form "*septentrionalis*", Alsace.
Fig. 16. *L. i. aegus* (Chapman), Versoix, vic. Geneva, 1,200 ft. alt., 5.VI.-1917, *leg.* Reverdin, Ac.N.S.Phila.
Fig. 17. *L. i. euergetes* (Stauder), same data as fig. 4.
Fig. 18. *L. i. calabricola* (Verity), San File, Cosenza (cp. fig. 21).
Figs. 19, 20. *L. i. ussurica* (Forster), Manchuria and Suchansky Rudnik, Ussuria.
Figs. 21, 22. *L. i. ssp.*, Chikoy R., Transbaikalia.


1 aynata
W. Sinkiang
2
3
4
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10
12
13
15
16
17
18
19 ussuriensis
Manchuria
20
21
22

PLATE 4

PLATE 4

Male undersides based on M.C.Z. specimens unless otherwise stated

Fig. 23. *L. ismenias zezuensis* (Seok), Quelpart Isl., S. Korea.
Fig. 24. *L. i. praeterinsularis* (Verity, Hemming), Honshu.
Fig. 25. *L. i. sinica* (Forster), E. Kansu.
Fig. 26. *L. i. ssp.*, N. Chihli, China.
Fig. 27. *L. i. ssp.*, Szechwan.
Fig. 28. Unnamed *sp.*, Alai, Fergana.
Figs. 29, 30, 31, 32. *L. i. christophi* (Stdgr.), Samarkand, Askabad, Aksu, and Lower Ladak (form "*samudra*").
Figs. 33, 34. *L. argyrognomon anna* (Edw.), Yosemite, Calif. and L. Tahoe, the last Ac.N.S.Phila.
Figs. 35, 36, 37, 38, 39, 40. *L. a. ricei* (Cross), Fort Klamath, Or. (Ac.-N.S.Phila), Mt. Rainier, Wash. (second and third), Brewster, Wash., and Vancouver Isl., B. C. (last two). Fig. 36 is form "*fretchini*".
Fig. 41. *L. a. lotis* (Lintner), Mendocino, Calif. A.M.N.H.
Fig. 42. *L. a. lotis, prox.*, Pt. Arena, Mendocino Co.
Fig. 43. *L. a. lotis*, female type, N. Y. State Mus.
Fig. 44. *L. a. atrapraetextus* (Field), Priest R., Idaho.
Fig. 45. *L. a. ssp.*, Beaver Cn., Boise, *leg.* Snyder, Ac.N.S.Phila.
Fig. 46. *L. a. atrapraetextus*, form "*sweadneri*", Uranus Peak, Idaho.

23
24 pseudorinsul
25 sinica
26
27 Szechwan
28 Ala
29 christophi
30 christophi
31 christophi
32 samudra
33 anna
34 anna
Summit, Cal
35 ricei
36 fletcheri
37
38
39
40 Vancouv.
41 lotis
43 lotis
42 Ft. Arena
44 atrapiact.
45 Beaver Co
46 sweadneri

PLATE 5

PLATE 5

Male undersides based on M.C.Z. specimens unless otherwise stated

Figs. 47, 48, 49, 50. *L. argyrognomon ferniensis* (Chermock), the first Fernie, B. C., holotype, the rest Didsbury, Alberta.

Figs. 51, 52. *L. a. alaskensis* (Chermock), McKinley and Circle, Alaska, the second a paratype, CM.

Figs. 53, 54, 55, 56, 57, 58, 59. *L. a. scudderi* (Edwards), Gr. Slave L., Mack. (form "*subarcticus*"), Pequot, Minn., Atlin, B. C. (trans. to *ssp. alaskensis*), Tonquin Vy., Alb., Saskatchewan R. (topotype), Natashquan, E. Quebec (trans. to *ssp. aster*), and Riding Mts., Manitoba.

Figs. 60, 61, 62. *L. a. aster* (Edw.), Baddeck, N. S. (form "*empetri*"), Newfoundland (topotype, Ac.N.S.Phila.), and Labrador.

Fig. 63. *L. a. ssp.*, Camp Roosevelt, Yellowstone.

Fig. 64. *L. a. longinus* Nabokov, paratype, vic. Jackson, Wyo., A.M.N.H.

Fig. 65. *L. a. sublivens* Nabokov, holotype, Telluride, Colo.

Fig. 66. *L. a.* ? *ssp.*, female, San Isabel Forest, above Beulah, 7,500 ft. alt., Colo., *leg.* Stallings.

Figs. 67, 68, 69, 70. *L. melissa melissa* (Edwards), Didsbury, Alb. (first two), Lloydminster, Sask., and Birtle, Manitoba.

47 ferrucus
48 fermesis
Didsbury, Alb
49 Didsbury
50 Didsbury
51 arassensis
McKinley
52
53 subarctica
54 Peguis
55
56 Jasper Nat. Pk
Alberta
57 scudderi
58 Natashquan
quebec
59 Ridings Mt
60 empetri
Nova Scotia
61 aster
62 aster
Labrador
63 yellowstone
64 Jackson
Wyoming
65 sublivens
Telluride Colo
66
SE Colorado
67 melissa
Didsbury, Alb
68 melissa
Didsbury, Alb
69 melissa
Saskatchewan
70 melissa
Manitoba

PLATE 6

PLATE 6

Male undersides based on M.C.Z. specimens unless otherwise stated

Figs. 71, 72, 73, 74. *L. melissa melissa* (Edwards), Alma, (vic. type loc.), vic. Fairplay (female, topotype), the last two La Veta, all Colo.

Figs. 75, 76. *L. m. pseudosamuelis* Nabokov, holotype and female paratype, Red Mt. Inn, Pitkin Co. and Lake Co., Colo.

Figs. 77, 78. *L. m. samuelis* Nabokov, vic. Albany, N. Y. (paratype, *ex* A.M.N.H.), and Toronto, Ont. (paratype, ST).

Figs. 79, 80, 81, 82, 83, 84, 85, 86. *L. m. melissa* (Edw.), Mendocino Co. (CM), Modoc Co., Sierra Co., Calif. (form "*fridayi*"), Fallon, Nev., Salt L. City, Ut., above Salt L. City, 5,500 ft. alt., and two (the last a female) transitions to next, Alta, Ut., 8,500 ft. alt.

Figs. 87, 88, 89, 90. *L. m. annetta* (Edw.), the second a female, all Alta, Wasatch Mts., Ut.

Figs. 91, 92, 93. *L. m. inyoensis* (Gunder), Owens L., Tehachapi and Lebec, S. Colo. (the last ST).

Fig. 94. *L. m. melissa* (Edw.), Pine Vy., San Diego.

71 melissa
Alma Colo
72 melissa ♀
73 melissa
74 melissa
75 pseudosamuelis
76 pseudosamuelis
77 samuelis
78 samuelis
79 melissa
80 melissa
81 fridayi
82 Falcon Nevada
83 melissa
84 melissa
85 melissa
86 annetta plot ♀
Wasatch Mts
87 annetta
Wasatch
88 annetta ♀
89 annetta
Wasatch Mts
90 annetta
Wasatch Mts
91 ingoensis
Owens Calif
94 ingoensis
Tehachapi Calif
93
Lebec Calif
94
Pine valley, Calif

PLATE 7

PLATE 7

Female uppersides based on M.C.Z. specimens unless otherwise stated

Fig. 95. *L. argyrognomon agnata* (Stdgr.), W. Sinkiang.
Fig. 96. *L. a. bellieri* (Oberthür), Corsica.
Fig. 97. *L. a. armoricana* (Oberthür), Rennes, Brittany.
Fig. 98. *L. a. lycidasoides* Beuret, Alsace.
Fig. 99. *L. a. acreon* (Fabr., Forster), Isaszegh, Hungary.
Fig. 100. *L. a. ultima* (Verity), Monti de Atina, Ac.N.S.Phila.
Fig. 101. *L. a. nevadensis* (Oberthür), Tragacete, Nueva Castilla, 4,500 ft. alt., *leg.* Querci.
Fig. 102. *L. i. euergetes* (Stauder), Peszer, Hungary, *leg.* Uhrik.
Fig. 103. *L. a. subsolanus* (Eversmann), N. Korea, *leg.* Seok.
Fig. 104. *L. i. calabricola* (Verity), San Fili, Cosenza.
Figs. 105, 106. *L. i. ssp.*, Chikoy R., Transbaikalia.
Fig. 107. *L. i. zezuensis* (Seok), Korea, *leg.* Seok.
Fig. 108. *L. i. sinica* (Forster), E. Kansu.
Fig. 109. *L. i. ssp.*, N. Chihli.
Fig. 110. *L. i. praeterinsularis* (Verity), Tokio.
Figs. 111, 112. *L. i. ismenias*, Alsace and Kitzingen, Bavaria, *leg.* Krodel. (this is the "*argyrognomon argyrognomon*" of recent authors; see Nabokov, Psyche, **51**, pp. 105–107).
Fig. 113. *L. i. christophi* (Stdgr.), Charjui, Turkmenistan.

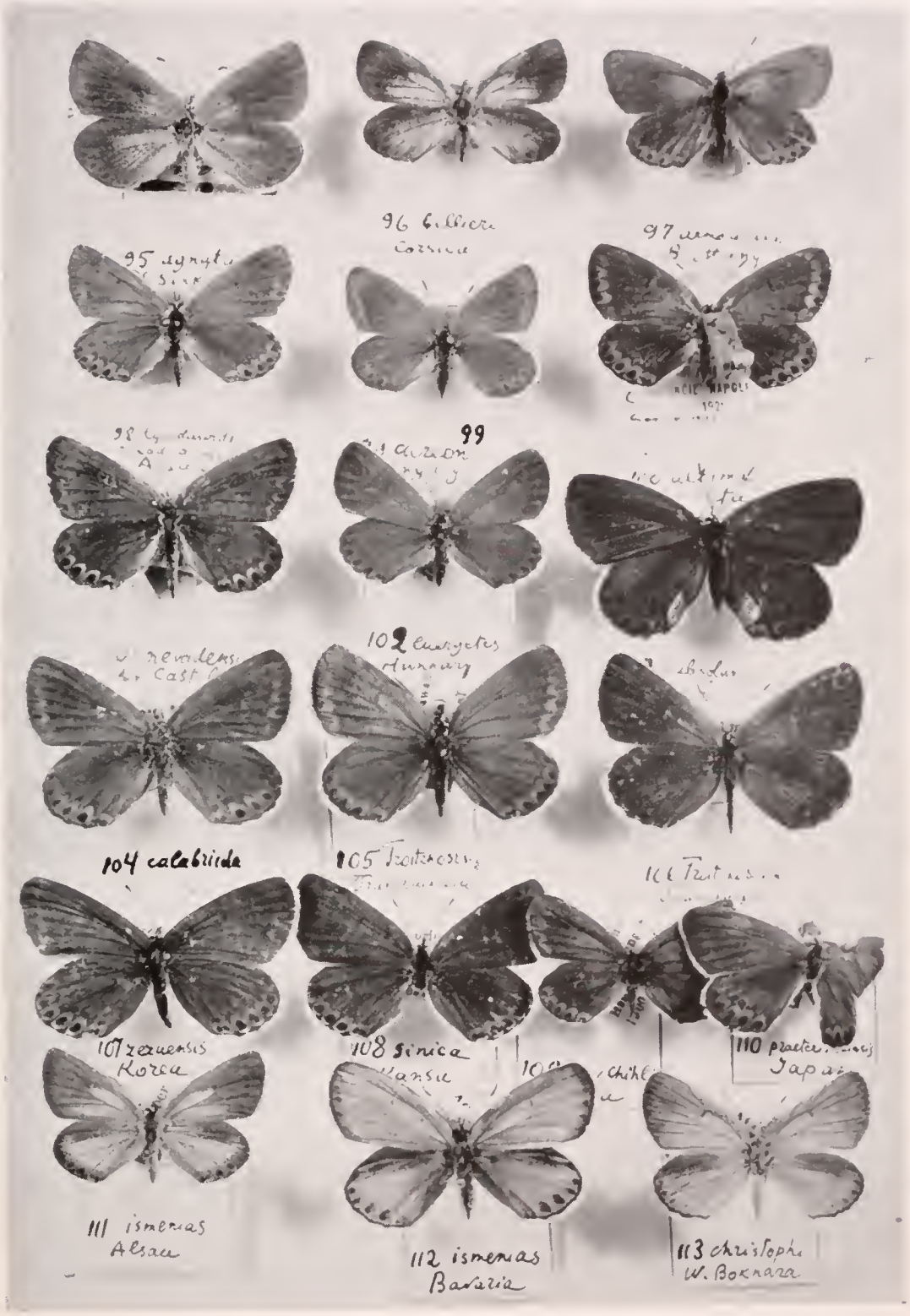

96 Callicia
Corsica
97
99
104 calabrida
107 zeuxensis
Korea
108 sinica
110
111 ismenias
Alsace
112 ismenias
Bavaria
113 christophi
W. Bokhara

PLATE 8

PLATE 8

Female uppersides based on M.C.Z. specimens unless otherwise stated

Figs. 95, 96, 97. *L. argyrognomon anna* (Edwards), Nevada, L. Tahoe, Calif., and Sequoia Ntnl. Frst., Calif.

Figs. 98, 99, 100, 101, 102. *L. a. ricei* (Cross), Crater L. Or. (5.VIII.1913, *leg.* Engelhardt), Kirk (same data), Mt. Rainier, Wash. (form "*fretchini*", third and fourth) and Vancouver Isl., B. C.

Figs. 103, 104, 105. *L. a. ferniensis* (Chermock), Fernie, B. C. (allotype), Cranbrook, B. C., and Didsbury, Alberta.

Fig. 106. *L. a. longinus* Nabokov, allotype, Jackson Hole, Wyo.

Fig. 107. *L. a. lotis* (Lintner), *prox.*, Pt. Arena, Mendocino Co., Calif., ST.

Fig. 108. *L. a. lotis*, type (upperside of Pl. 4, fig. 43).

Figs. 109, 110. *L. a. atrapraetextus* (Field), Uranus Pk., Idaho (form "*sweadneri*") and Priest R.

Figs. 111, 112, 113, 114. *L. a. scudderi* (Edwards), Jesmond, B. C. (CM; trans. to *ssp. ferniensis*), Atlin, B. C. (trans. to *ssp. alaskensis*), Laggan, Alberta, and Arrowhead Trail, Minn.

Fig. 115. *L. a. alaskensis* (Chermock), paratype, Ft. Yukon, Alaska, CM.

Fig. 116. *L. a. scudderi* (Edw.), McCreary, Manitoba.

Figs. 117, 118. *L. a. aster* (Edw.), Labrador (cp. *melissa samuelis*, Pl. 9, fig. 125) and Baddeck, N. S. (form "*empetri*").

95 anna
96 anna
97 anna
98 rusticus
99 rusticus
100 fletcheri
101 fletcheri
107 Vanc. Isl
103 fermeensis
104 fermeensis
105 fermeensis
106 longinus
07 Pt Arena
108 lotis ♀
type (photog?)
109 swadneri
110 atrapictatus
111 scudderi
112
113 scudderi
Zaggan, Alberta
114 scudderi
Cook Co Minnesota
115 alaskensis
Ft Yukon
116 Scudderi
McCreary, Man.
117 asterpros
118 empetri
Nova Scotia

PLATE 9

PLATE 9

Female uppersides based on M.C.Z. specimens unless otherwise stated

Figs. 72, 119. *L. melissa melissa* (Edw.), topotype (same specimen as Pl. 6, fig. 72) and Chivington, Colo.

Fig. 120. *L. m. pseudosamuelis* Nabokov, allotype, Red Mt. Inn, Pitkin Co., Colo.

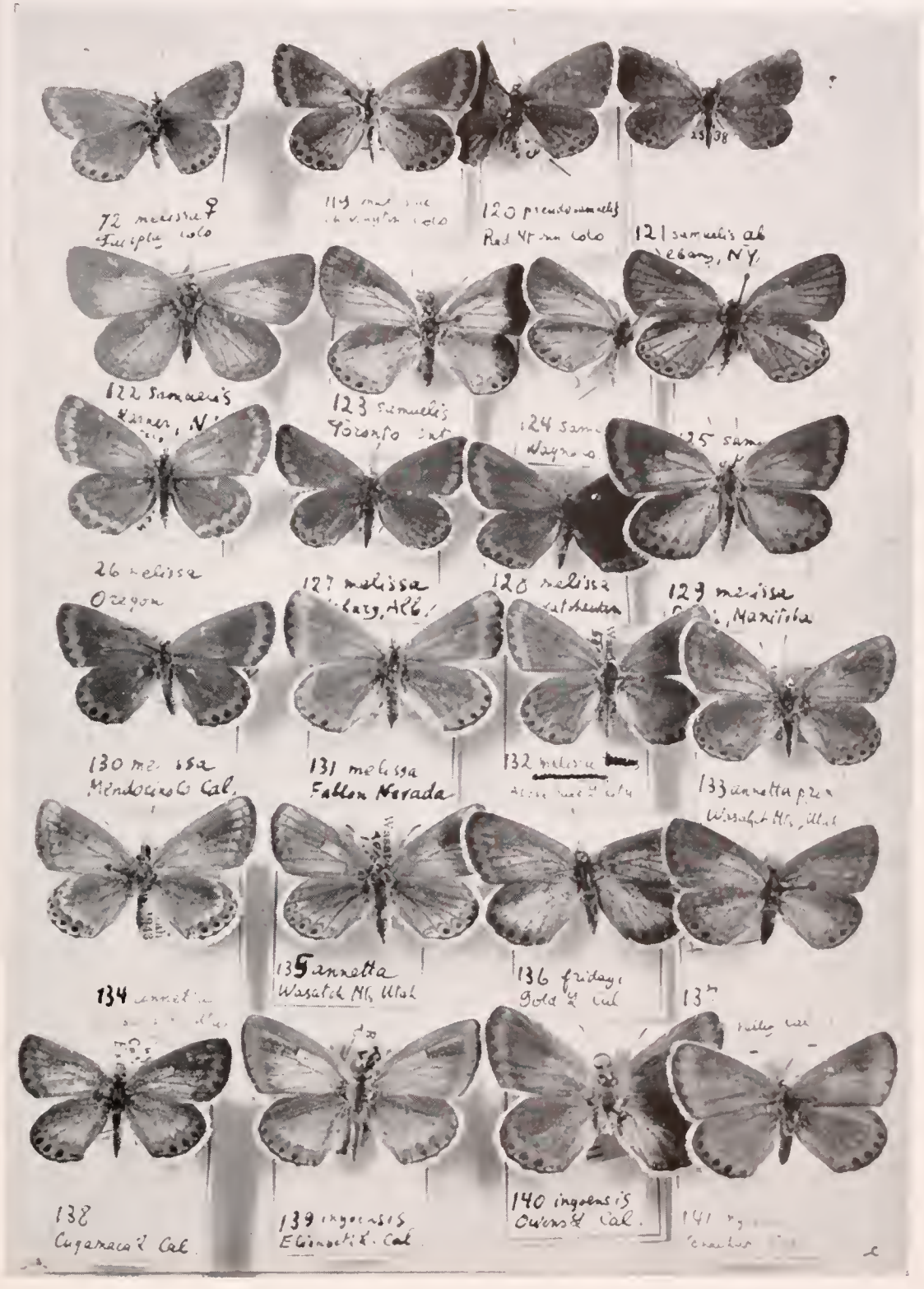
Figs. 121, 122, 123, 124, 125. *L. m. samuelis* Nabokov, vic. Albany, N. Y. (25.VII.1938, HC, paratype, aberrative; cp. with preced.), same loc. (16.VI.-1876, *leg.* Bailey, *ex* coll. Grey, paratype; cp. with *argyrognomon scudderi*, Pl. 8), Toronto, Ont. (paratype, ST), Wayne Co., Penna. (*ex* coll. Snow, *ex* Ac.N.S.Phila.) and Nashua, N. H. (14.VIII.1907, *leg.* W. P. Comstock, paratype).

Figs. 126, 127, 128, 129, 130, 131, 132. *L. m. melissa* (Edw.), Durkee, Or. (HC), Didsbury, Alb., Lloydminster, Sask., Birtle, Manitoba, Mendocino Co., Calif. (CM), Fallon, Nev., and above Salt L. City, 5,500 ft. alt.

Figs. 133, 134, 135. *L. m. annetta* (Edw.), Alta, Wasatch Mts., early VIII.1943.

Figs. 136, 137, 138. *L. m. melissa* (Edw.), Gold L., Sierra Co., Calif. (form "*fridayi*"), Pine Vy. (ST) and Cuyamaca L., San Diego Co., Calif.

Figs. 139, 140, 141. *L. m. inyoensis* (Gunder), Elizabeth L., Calif. (Ac.-N.S.Phila.), Owen's L. and Tehachapi.


72 melissa ♀
Eureka, Colo
120 pseudomelissa
Red Mountain Colo
121 samuelis ab
Ithaca, N.Y.
122 Samuels
123 Samuelis
Toronto Ont
26 melissa
Oregon
127 melissa
Lacy, Alb.
128 melissa
Saskatchewan
129 melissa
Manitoba
130 melissa
Mendocino Co Cal.
131 melissa
Fallon Nevada
132 melissa
133 annetta ♀
Waterton Park, Alta
134
135 annetta
Waterton Park, Alta
136 fridayi
Gold Hill Col
137
138
Cuyamaca ♀ Cal
139 ingoensis
Echinocactus Col
140 ingoensis
Owens R Cal.
141

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Bulletin of the Museum of Comparative Zoölogy

AT HARVARD COLLEGE

VOL. 101, NO. 5

THE PLACENTATION OF THE PRONGHORNED ANTELOPE (ANTILOCAPRA AMERICANA)

By GEORGE B. WISLOCKI and DON W. FAWCETT

WITH THREE PLATES

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No. 5 — *The placentation of the pronghorned antelope (Antilocapra americana)*

By George B. Wislocki and Don W. Fawcett
Department of Anatomy, Harvard Medical School, Boston, Mass.

The pronghorned antelope (*Antilocapra americana*) forms a single species and genus, assigned by Weber ('28) to the subfamily Antilocaprinae of the cavicornia (Bovidae). Weber remarks that some others have assigned a higher and more independent position to it, on an equal level with the families of the cervicornia (Cervidae) and vellericornia (Giraffidae). He, himself, regards it as an animal which has distinct although distant relationships to the Cervidae but is at the same time related to the antelopes or at least to the cavicornia in general. In its geographical isolation it has followed its own path, becoming specialized as well as retaining a number of primitive characters.

The placentation of this animal does not appear to have been investigated before. The placenta and fetal membranes will be described in the present paper, and they will be compared briefly with those of related animals.

MATERIAL AND METHODS

The material at our disposal consists of 4 pregnant uteri. Two of them were obtained from the Montana Fish and Game Department through the assistance of Dr. Philip L. Wright of Montana State University. The 2 others were received from Dr. Charles H. Rouse of the Fish and Wildlife Service, U. S. Department of the Interior.

Each of the 4 uteri contained twins, of which 3 pairs were of opposite sexes but in 1 case both were males. The members of the respective pairs were approximately 18, 21, 23 and 37 cm. in crown-rump length. The specimens from Montana are undated whereas the 2 from Nevada were obtained on February 26 (23 cm.) and April 9 (37 cm.).

The pregnant uteri were placed in 10% formalin, all of them except 1 having been opened to some degree to improve fixation. For purposes of histological topography the specimens are quite adequately preserved, but for detailed histology and cytology their fixation is less good. Despite this, they have yielded important information regarding the character of the placenta and the fetal membranes, and 1 in particular (23 cm.), of which several illustrations are presented, shows quite satisfactory histological detail.

Representative pieces of the placenta and membranes were embedded in paraffin, sectioned, and stained in hematoxylin and eosin, eosin and methylene blue, or Masson's connective tissue stain.

GENERAL TOPOGRAPHY OF THE PLACENTA AND FETAL MEMBRANES

The 4 specimens are very similar in appearance. The relations and topography of the twin placentas and fetal membranes to one another and to the uterus are illustrated semidiagrammatically in figure 1. This drawing was prepared from the youngest specimen which contained fetuses of 18 cm. A fetus and its placenta occupy each of the 2 horns of the bicornuate uterus. The drawing reveals the interior of the uterus with the amniotic sacs opened and the fetuses removed. The fetal membranes are symmetrically arranged in the 2 horns of the uterus with the umbilical cords and allantoic sacs oriented toward the lesser curvatures (mesometrial borders) of the uterine horns. In the right uterine cornu (left-hand side of drawing) the allantoic sac is represented as having had its ventral wall removed.

The chorion is studded with a large number of cotyledons which are located on the dorsal and ventral surfaces of the chorion. The vessels of the umbilical cord divide at the mesometrial border of the chorion into arteries and veins which pass dorsally and ventrally to supply the cotyledons with blood. In figure 1 the cotyledons are seen indistinctly on the left side through the unopened, transparent allantois, whereas in the right cornu, where the ventral wall of the allantois has been removed, they are more sharply outlined.

The cotyledons vary in size. In the youngest specimen (18 cm. fetuses), each placenta consists of a score of large cotyledons, measuring from 1½ to 2¼ cm. in diameter and a lesser number of small ones varying from 1½ cm. down to 3 or 4 mm. in diameter. The large cotyledons are located on the dorsal and ventral surfaces of the chorion in zones paralleling the mesometrial border of the uterus. The small cotyledons are more irregularly situated, some being located at the ends and others in the anti-mesometrial region of the elongated chorionic sac. In general they seem to occur in regions which are less favored by the allantoic blood supply.

In the oldest specimen (37 cm. fetuses) the largest cotyledons have attained diameters of 3½ to 4 cm. indicating that they have slowly increased in size. The cotyledons are mainly circular but a few are oval. The allantoic blood vessels entering and leaving on one side lend a racket-shaped appearance to some of them.

Approximate counts of the cotyledons in the 4 uteri yield the following figures:

Numbers of cotyledons in each placenta (right and left)

	Spec. 1		*Spec. 2*		*Spec. 3*		*Spec. 4*	
	r	*l*	*r*	*l*	*r*	*l*	*r*	*l*
Large cotyledons	20	22	32	33	25	27	38	37
Small cotyledons	17	18	16	17	21	20	24	23
Totals	37	40	48	50	46	47	62	60

There appears to be some increase in numbers with age, but whether or not this is a significant and constant feature we do not know.

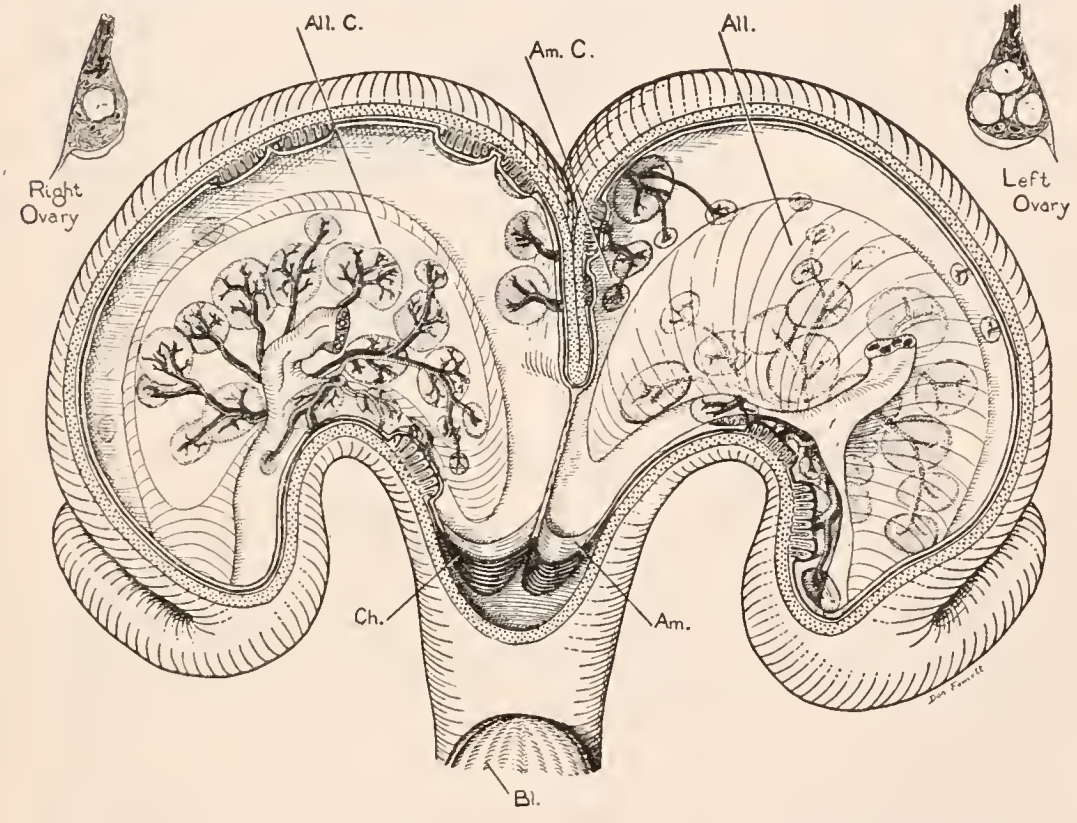

Fig. 1. Diagrammatic drawing of the interior of a pregnant uterus of Antilocapra americana, illustrating the shape and relationships of the gestation sacs. The fetuses (18 cm. crown rump lengths) have been removed to show to better advantage the arrangement of the chorion, amnion, allantois and cotyledons. Observe the fused amnions in the corpus uteri. For further information consult text. All., Allantois; All. C., Allantoic Cavity; Am., Amnion; Am. C., Amniotic Cavity; Bl., Urinary Bladder; Ch., Chorion. x ¼.

In the upper corners of the diagram cross-sections of the ovaries are presented revealing the presence of 4 corpora lutea.

In the stages of development examined by us the amniotic cavities are much larger than the allantoic sacs (fig. 1). The latter are crescentic in shape conforming to the curving mesometrial borders of the uterine horns. Each allantoic sac presents an outer vascular surface which is fused with the dorsal wall of the chorion to constitute the allanto-chorion and an inner surface which is avascular and transparent. The degree of fusion of chorion and allantois varies considerably in individual placentas. For example, in 1 of the specimens the allantois in 1 gestation sac is fused extensively with the chorion, whereas in the opposite chorionic sac the area of fusion is relatively slight. The relationships of the allantois, chorion and amnion in a transected uterine

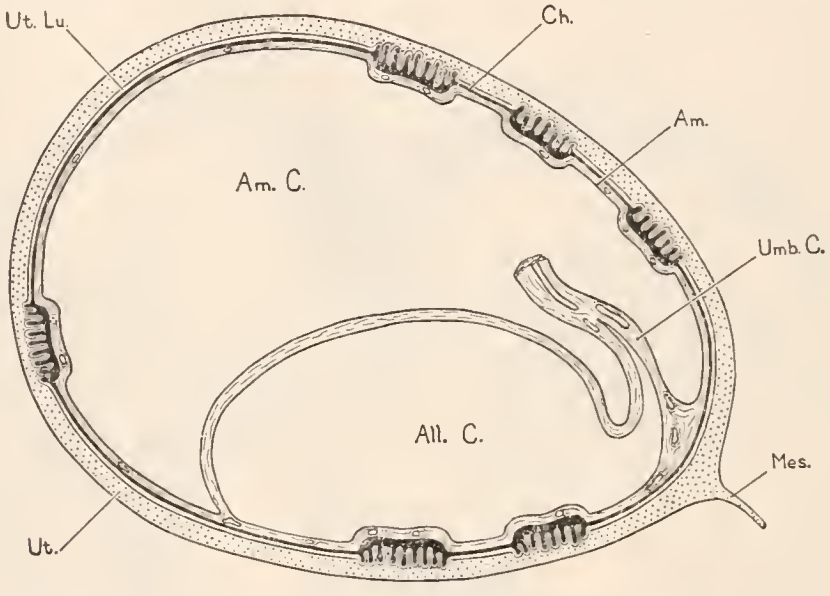

Fig. 2. Diagram of a transected uterine horn illustrating the relationships of the fetal membranes. All. C., Allantoic Cavity; Am., Amnion; Am. C., Amniotic Cavity; Ch., Chorion; Mes., Mesometrium; Umb. C., Umbilical Cord; Ut., Uterus; Ut. Lu., Uterine Lumen.

horn are illustrated diagrammatically in figure 2. Because of the relatively small size of the area of allanto-chorionic fusion the area of contact of chorion and amnion is correspondingly great. Despite the varying degree of actual fusion between chorion and endodermal allantois, the allantoic blood vessels radiate in all directions into the chorionic mesoderm giving rise to a typical chorio-allantoic placenta.

The 2 gestation sacs are fused in the midline in the region of the corpus uteri. A histological section placed through the membranes in this area reveals that the 2 amnions are united back to back, the inter-

vening chorions having undergone complete regression (fig. 5). A few small blood vessels are visible in the mesenchyma uniting the 2 gestation sacs so that one must accept the possibility of vascular ansatomoses existing between them. Yet barring evidence from injected specimens or any observations on the occurrence of free-martins, one would not be justified in assuming a priori that vascular anastomoses actually occur.

THE UMBILICAL CORD

The umbilical cords are short and stout, their lengths in the 4 specimens ranging from 5 to 10 cm. The surfaces of the cords are covered by minute brownish papillae which extend up to 1 mm. in length. Histological sections show these to be papillary thickenings of the amniotic epithelium covering the cord (figs. 6 and 7). These amniotic plaques extend out for only a short distance onto the membranous amnion beyond the confines of the umbilical cord. In cross-section the cord is seen to contain 2 pairs of umbilical blood vessels separated by the slit-shaped lumen of the allantoic duct which lies in the center of the flattened cord (fig. 6). The stroma of the cord is vascularized by minute blood vessels which arise from the umbilical arteries and veins.

THE HISTOLOGY AND CYTOLOGY OF THE COTYLEDONS

In cross-section the cotyledons are seen to consist of interdigitating fetal and maternal tissues as illustrated in figures 3, 4, and 10. In the small cotyledons the slightest traction on the chorion and uterine wall pulls the fetal and maternal elements apart, and in the larger cotyledons very little more force is required to separate them. When they are pulled asunder, the exposed fetal surface has a shaggy, papillary appearance, whereas the maternal part or caruncle is pitted, illustrating that the cotyledons are composed of fetal villi projecting into mucosal crypts (fig. 12). Examination of histological sections of cotyledons cut horizontally bears out this conclusion. The cross-sections of the fetal villi are observed to lie in compartments created by the septal walls of the mucosal crypts (fig. 9).

The cotyledons of Artiodactyla have been divided into 3 general types. When the endometrium of the cotyledon is polypoid in form and is capped by the chorion, it is said to be convex. When, on the other hand, the endometrium of the cotyledon appears to be excavated

with a wall around the periphery so that the chorion extends into it in a polypoid manner, the cotyledon is described as being concave. But, if the cotyledon is contrived so that its base and top are both relatively flat and the axes of the interdigitating fetal papillae and maternal crypts are more or less parallel to one another instead of being fan-shaped, it is referred to as being flat or intermediate. By reference to figures 3, 4 and 12, it will be observed that the cotyledons of the pronghorned antelope are of the intermediate or flat type.

The cotyledons are sufficiently well preserved in two of the 4 specimens (18 and 23 cm. fetuses) to allow of a reasonably accurate histological and cytological study. Their microscopic structure is portrayed in figures 3, 4, 9, 10 and 11. The primary chorionic villi, projecting into the crypts of the mucosa, are plump, digitiform and tapering (figs. 3 and 4). They give off numerous, extremely short, leaf-like secondary villi at right angles to the primary ones (figs. 4, 9 and 10). Similarly, the compartmental walls of the endometrial crypts bear low folds or rugae which engage with the secondary fetal villi (fig. 10). The maternal and fetal surfaces of these structures in all parts of the cotyledon appear to be completely clothed by epithelium (fig. 11) thus giving rise to a characteristic epithelio-chorial placenta according to the classification of Grosser. The secondary chorionic villi or rugae are separated by troughs or fossae. The latter are lined by low columnar cells, whereas the tips of the folds are covered by cuboidal cells which are variously deformed by their intimate association with a rich and irregular capillary bed. The blood vessels in the chorionic villi form plexuses in which individual capillaries penetrate the epithelium dislocating its cells and spreading them apart. This brings the capillary walls at many points almost to the surface of the villus and reduces the overlying cytoplasm of the epithelium to the thinnest of membranes. It is here doubtlessly that the most direct and readiest interchange, especially of gases and other readily diffusible substances, takes place between the fetal and maternal circulations. At many points the capillaries appear to tunnel the epithelium to a degree which suggests the designation "intraepithelial capillaries."

The columnar epithelial cells lining the fossae between the villi rest upon a delicate, regular basement membrane with which capillaries are associated. The cells are largest in the bottoms of the troughs and diminish in height on the sides of the villi until they become quite small and very irregular toward the tips. At the distal ends of the cells a well-defined brush border and a suggestion of terminal bars are visible. Just beneath the brush border in the distal portion of the cyto-

plasm there is a dusting of bright red acidophilic granules. The brush border is heavier and more distinct on the cells of the fossae than on the cells covering the villi. These various features of the cells are illustrated in figure 11 which was drawn from the rectangular field indicated in figure 10. In sections stained with eosin and methylene blue, the infranuclear portion of the cytoplasm is basophilic whereas the supranuclear half of the cells is acidophilic.

Besides the low columnar and cuboidal cells regularly covering the chorionic folds and the fossae between them, giant cells are encountered in the chorion. These possess a large amount of cytoplasm and one or two nuclei which are frequently hyperchromatic (fig. 11). They are irregularly distributed, in some villi none being seen, whereas in others 3 or 4 may be visible within a short distance of one another. Sometimes they are intercalcated between the ordinary chorionic epithelial cells and consequently form part of the surface but more frequently they are located beneath the regular chorionic cells. They appear to occur more frequently on the tips and sides of the secondary villi than in the fossae.

The maternal folds or rugae which interdigitate with the fetal villi consist of a vascular stroma which is covered by epithelium (figs. 10 and 11). The small blood channels penetrate very close to the surface and in many places only a very delicate membrane of cytoplasm intervenes between their lumens and the surface of the endometrium. The epithelial cells covering the endometrium are very much flattened and possess indistinct boundaries. In some places the nuclei are fairly close together and the cytoplasm is quite distinct, but in many other places the nuclei are far apart and the cytoplasm is hardly distinguishable. Where the cytoplasm is thinnest the capillaries lie very close to the surface. The absence of distinct boundaries in the epithelium suggests that it is syncytial (fig. 11) and, indeed, in some places it may be incomplete, although this latter point cannot be proven with the present material.

In the lumen of the uterus between the mucosa and the chorion, especially in pockets which are regularly present between the endometrium and the chorionic fossae, secretion or "uterine milk" is encountered. It is probable that this is mainly secreted by the uterine glands. The brush borders of the chorionic cells project into this secretion and it is presumably absorbed by these cells as nourishment for the fetus. No extravasated maternal blood is visible in the uterine milk or in any other part of the cotyledons.

The uterine glands are simple tubules lined by cuboidal epithelial

cells. Their nuclei and cytoplasm stain deeply with methylene blue, an observation which suggests the presence of ribonucleoprotein in their cytoplasm. The glands appear to be no less numerous beneath the cotyledons than elsewhere. We have not investigated their topography as to shape, length, course, or outlets beyond what has been revealed by occasional histological sections. We have not encountered any of their ducts emptying directly into the endometrial crypts into which the primary fetal villi project which suggests that those beneath the cotyledons may open along their margins. Elsewhere they apparently open directly into the uterine space between the endometrium and the membranous chorion.

The endometrium is clothed by pseudostratified epithelium composed of relatively small irregular cells with vacuolated, basophilic cytoplasm. The membranous chorion also consists of pseudostratified epithelial cells which are individually larger than the endometrial cells and somewhat less basophilic. Between these cells numerous giant cells, identical with those described in the chorionic villi of the cotyledons, are intercalated. These may possess a single large nucleus or 2 smaller, hyperchromatic ones. Because of the relatively imperfect state of fixation, the material does not reveal more cytological details. Between the endometrium and the membranous chorion there is a variable layer of secretion and detritus which is presumably derived from the uterine glands and the uterine surface epithelium.

In the few sections which have been examined, occasional minute areas of the epithelium of the membranous chorion appear to be infolded (fig. 8). These pockets give no evidence of their presence upon naked eye examination of the chorion. They resemble to a slight degree the well-known areolae of the chorion of the sow, but they are simpler in structure and microscopic in dimensions. The pseudostratified, basophilic epithelium lining them borders a narrow lumen which contains material which is faintly acidophilic. We have not ascertained how characteristic of the membranous chorion or how frequent these structures may be.

Decidual transformation of the endometrium does not occur at the maternal surface of the cotyledons or elsewhere in the uterine mucosa. There are no signs of regressive or degenerative changes in the uterine stroma and there is no extravasation of blood from any maternal vessels. Moreover, there is little evidence that the syncytial uterine epithelium has disappeared at all. Since the present specimens are from the middle third of gestation, it is possible that some of the syncytium might regress in late gestation. Yet, up to the middle of

gestation, it is apparent that the placenta is of the epitheliochorial variety rather than of the syndesmochorial type and, if it should eventually become syndesmochorial, it would be for only a relatively brief terminal phase.

What we have called small cotyledons from naked eye examination of the gestation sac prove upon closer examination to be essentially the same as the large cotyledons, the principal difference being that they are smaller and simpler. The chorionic villi and uterine crypts composing them are respectively shorter and shallower and consequently the chorion and mucosa separate more easily than in the larger cotyledons. They range in size downward from the large structures to fields a few millimeters in diameter in which, upon microscopic examination, quite short chorionic villi engage with extremely shallow mucosal crypts and folds. They do not appear to be degenerating structures, but rather to represent smaller, accessory cotyledons which range by transition down to mere patches of villi.

The ovaries. The 4 pairs of ovaries were sliced with a knife. It is of interest that, although each uterus contained twins, examination of the respective pairs of ovaries revealed 4 corpora lutea in each of 2 pairs, and 6 in the 2 others. The discrepancy is probably to be accounted for by the failure of all but 2 of the eggs to implant and maintain themselves. The gross appearance of 1 pair of the sectioned ovaries is shown in figure 1 in which 4 corpora lutea are present.

DISCUSSION

It is of some interest to compare the placentation of the pronghorned antelope with that of other groups of the Artiodactyla. Such comparisons should involve the general form and arrangements of the placenta, as well as the evidence derived from examination of its microscopic structure.

Attempts have been made in the past to compare and classify the placentas of the Perissodactyla and Artiodactyla. They have been divided into those that are diffuse, those which possess a few large cotyledons and those which have numerous smaller cotyledons or in slightly different terminology into acotyledonary, oligocotyledonary and polycotyledonary groups (cf. Andresen, '27). The acotyledonary group includes the Equidae, Tapiridae, Suidae, Camelidae and Tragulidae which so far as is known possess diffuse chorioallantoic placentas provided with short villi. The oligocotyledonary group contains the Cervidae, with the exception of the musk deer (*Moschus moschi-*

ferus), all having a small number (6 to 9) of relatively large cotyledons (tabulated by Andresen '27, p. 428 for a dozen genera). A gravid uterus of *Odocoileus virginianus borealis* in our possession—a species not listed by Andresen—bears out this generalization; the uterus contains a single gestation sac with 6 large cotyledons. The polycotyledonary group comprises the Giraffidae and the Bovidae. The giraffe is said to possess upwards of 180 cotyledons, *Bos taurus* around 100, sheep, goat and chamois between 60 and 140, and antelopes, of which specimens of some 9 genera have been examined, between 20 and 100 (cf. Andresen, '27, and Mossman, '37). *Tetraceros quadricornis* (the 4-horned antelope) contains as few as 20 to 30 (Weldon, '84), and *Adenota kob* is described as possessing only 18 large cotyledons (Krölling, '31). In this regard the pronghorned antelope which we are examining belongs to the polycotyledonary type although like *Tetraceros quadricornis* and *Adenota kob* it has fewer than the average number for the group.

The cotyledons of the Artiodactyla have also been classified according to their shapes, more particularly in reference to the relations of chorion and mucosa as seen in transected cotyledons. They are of 3 general types,—convex, concave and flat or intermediate. In the convex type the mucosa is polypoid and is capped by the chorion; this form is encountered in deer, cattle and some antelopes. The convex type is the reverse of the previous one, the chorion projecting in a polypoid manner into a cupshaped excavation of the mucosa; this is encountered in sheep, goats and chamois. The flat or intermediate type presents maternal and fetal interdigitations arising from broad bases with the consequence that neither is polypoid; this type is encountered in various antelopes as well as in Antilocapra. For a convenient diagrammatic representation of these 3 forms the reader is referred to an article by Mossman ('37, plate 24). In this connection, it is of interest to recall that the cotyledons are regarded as arising on the chorion in relation to specialized permanent elevations which exist in the uterine mucosa (carunculae). Consequently, the size, shape and distribution of the cotyledons appear to be determined in large measure by the mucosa.

It has also been proposed to classify cotyledons on the basis of the thickness and degree of branching of the fetal villi which compose them. The villi have been designated as broad and narrow by Strahl ('11) and Sedlaczek ('12), but Grosser ('27) divides them on a somewhat different basis as follows: (1) digitiform, plump and slightly branched villi as in the roe deer (*Capreolus caprcolus*), red deer

(*Cervus elephas*) and antelopes, (2) richly branched villi with expanded, leaf-like terminations as in cattle, and (3) villi which are plump at their bases but at their tips are richly arborized as in sheep and goats.

The chorionic villi of the cotyledons of Antilocapra fit none of these 3 groups exactly, instead seeming to fall between groups 1 and 2. In order to acquaint ourselves at first hand with the topography of the chorionic villi in the cotyledons of various Artiodactyla we undertook a comparative examination of them, using the available literature as well as specimens of our own. These comparisons have impelled us to reclassify the chorionic villi of the cotyledonary placentas of the Artiodactyla as set forth below.

1. Plump, digitiform primary villi with smooth surfaces and some V-shaped branching toward the tips, as in the roe deer and red deer (cf. Grosser, '27), as well as in some antelopes (*Cervicapra* (=Redunca) *bohor:* Sedlaczek, '12 and Andresen, '27; *Adenota kob:* Krölling, '31).

2. Plump, digitiform, tapering primary villi with numerous extremely short, leaf-like, secondary villi arising at right angles from the main stems, as in the pronghorned antelope (*Antilocapra americana*).

3. Slender primary villi with numerous, slender secondary villi arising at right angles and tertiary villi forming V-shaped terminations, as in cattle.

4. Slender primary villi with numerous, slender, secondary and tertiary villi branching principally in a V-shaped manner, as in some deer (*Rangifer tarandus:* Kolster, '09; *Cervus* (=*Mazama*) *rufus:* Andresen, '22) and in at least one antelope (*Rhynchotragus kirkii:* Wislocki, '41). The cotyledons of a Virginia deer (*Odocoileus virginianus borealis*) in our possession also exhibit villi of this character and those of 2 other antelopes (*Hippotragus bakeri:* Sedlaczek, '12, and *Gazella rufifrons:* Krölling, '31) are probably also of this type but the pictures of them are too obscure to allow any definite conclusion to be drawn.

5. Plump primary villi which give rise at the periphery to slender richly arborizing secondary and tertiary villi, as in sheep and goats.

The classification outlined above represents, it is hoped, an advance toward clarifying the intricate patterns of the villi in these groups of animals. Doubtless, as further placental material is studied and other species are added, our scheme will become superseded by a more accurate one. Simple models or reconstructions of villi characteristic of these different species should be extremely instructive. Barring that procedure, investigators would be well advised always to compare the

villi as seen in perpendicular and horizontal sections through a cotyledon (e.g. figs. 4, 9 and 10).

Strahl ('11) and Sedlaczek ('12) divide placental cotyledons into "broad" and "slender" ones on a very different basis from the one proposed by Grosser which we have adopted and modified in the preceding paragraphs. Paying no attention whatsoever to the relative width of individual villi, these authors speak of a "broad" type in the presence of slender, but richly arborizing villi (e.g., sheep, cow) and of a "narrow" type in the presence of plump, relatively unbranched villi (e.g., some deer and antelopes). Their reason for this is that the former, resembling a tree with widely spreading branches, constitutes a "broad", fan-shaped arc, whereas the latter, resembling a tree with fewer, more perpendicular limbs, has a "narrow" spread. This descriptive principle would seem to offer less basis for comparison of these various forms than the criteria of shape, size and order of branching of the villi introduced by Grosser and ourselves.

Still another way of classifying the cotyledons of these various animals is on the basis of the degree of loss of the maternal epithelium and the amounts of maternal bleeding and decidual reaction which are present. The answers to these questions, for most of these animals, are far from satisfactorily known. Yet, it seems evident (Grosser, '27) that the most extensive degenerative change and decidual transformation occur in the mucosa of the sheep, the least in the cow and intermediate degrees in deer. By these tokens the cotyledons of cattle appear to be epithelio-chorial in nature according to the classification of Grosser ('27), whereas those of deer and sheep are very definitely syndesmo-chorial. In the cotyledons of antelopes, in so far as these features have been investigated, various combinations and degrees of loss of the uterine epithelium, decidual transformation and blood extravasates have been described. In *Gazella rufifrons* (Krölling, '31) and *Hippotragus bakeri* (Sedlaczek, '12) noticeable changes in the endometrium are described including bleeding. In *Rhynchotragus kirkii* (Wislocki,'41) decidual alterations without bleeding are recorded, whereas in *Adenota kob* the changes are so slight that Krölling concludes that its placenta is of the epithelio-chorial type.

The endometrium of the pronghorned antelope does not undergo any decidual transformation or give rise to extravasations of blood. Moreover, the uterine epithelium shows little if any loss. In these particulars its cotyledons resemble those of the cow and of *Adenota kob*. Consequently it seems justified to conclude that its placentation is of the epithelio-chorial variety.

Other cytological features of the placenta of Antilocapra include a brush border on the chorionic epithelium and the presence of trophoblastic giant cells many of which are binucleate. Brush borders have been so little studied in the placentas of the groups of animals which are dealt with here that the observation of them fails to offer any basis for comparison. It has been mentioned merely for several forms of deer that the epithelium of the chorionic villi possesses a brush border. As regards trophoblastic giant cells or diplokaryocytes, these have been described in the chorionic epithelium of the cotyledons of a variety of Artiodactyla, including cow and sheep (cf. Grosser, '27) and several antelopes (Krölling, '31, Wislocki, '41). In the cow they have been observed to increase in number as gestation advances.

It is perhaps worth pointing out that the finer histology of the secondary chorionic villi and intervening fossae of the placenta of Antilocapra is very similar to that of the pig's placenta, despite the fact that the one is diffuse and the other cotyledonary. With the exception of the diplokaryocytes which appear to be a feature solely of cotyledonary placentas, the size, shape and cytology of the villi in the 2 are very similar. They have cells of comparable size and arrangement covering the villi and lining the intervening fossae and they are both provided with brush-borders, and acidophilic granules. They are also vascularized in a similar manner. These likenesses will be appreciated by comparing figures 10 and 11 of the present paper with the villi of the pig illustrated in a paper by Wislocki and Dempsey ('46).

In regard to the affinities of the placenta of this animal to the other groups of the Artiodactyla it will have been noticed from the previous comparisons that its placenta has many generalized features which ally it widely to those of the other groups of the order as well as some very distinctive features of its own. Consequently it does not bear a very close resemblance or relationship to any one of the other groups. It will be recalled that it is polycotyledonary (relationship to cattle, antelopes, goats, sheep and giraffes) and of the flat type (relationship to some antelopes). However, in reference to the branching of the chorionic villi it shows only a generalized resemblance to the group, possessing a distinctive topography of its own. In respect to decidual reactions and bleeding it resembles cattle most closely, being farther removed from sheep and goats. The placenta appears to be of the epithelio-chorial variety, in this respect resembling cattle and several of the antelopes. Attention has also been called to the striking histological and cytological similarity of the chorionic villi of Antilocapra to the villi of the pig's placenta. This latter relationship indicates the

very generalized and wide affinities of the placenta of the pronghorned antelope.

SUMMARY

The placenta of the pronghorned antelope (*Antilocapra americana*) has been described for the first time. It is a chorio-allantoic placenta of polycotyledonary type possessing some 20 to 40 larger cotyledons and a lesser number of smaller ones. The cotyledons are round on surface view and of the flat type when viewed in cross-section. The cotyledons possess plump, digitiform, tapering primary chorionic villi which are thickly covered with minute, extremely short secondary villi. There is no observable decidual reaction or bleeding and the epithelium lining the endometrial crypts and folds appears to remain intact; consequently, the placenta is interpreted as being of the epitheliochorial variety.

In many features the placenta of this animal shows relationships to other groups of the Artiodactyla, without, however, being closely similar to any particular group. Furthermore, the peculiar pattern and manner of branching of the chorionic villi indicate that it is quite distinctively specialized.

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PLATES

PLATE 1

PLATE 1

Fig. 3. Cross-section of a typical large cotyledon of the placenta of Antilocapra americana. The chorionic villi arising from the chorion (on the right) project into the uterine crypts associated with the uterine wall (left). Fetal lengths 18 cm. Hematoxylin and eosin. x 4.

Fig. 4. A portion of the previous figure at higher magnification. The tapering, digitiform chorionic villi covered with minute leaflike secondary villi project into uterine crypts which are bounded by narrow septa bearing minute mucosal folds. (Fetal surface above, uterus below). Hematoxylin and eosin. x 12.

Fig. 5. A Section through the fused membranes of the twin fetuses from the corpus uteri (cf. fig. 1). The respective amnions are fused back to back with complete disappearance of all intervening chorionic epithelium. In the field, 2 small blood vessels are visible in the mesoderm uniting the amnions. Masson's stain. x 70.

Fig. 6. A section through the umbilical cord of one of the fetuses (18 cm.). Near the middle of the flattened cord, between the 2 pairs of blood vessels, the small slit-shaped lumen of the allantoic duct is barely visible. On the surface of the cord, in the upper right hand corner, a small, dark, protruding amniotic plaque is visible. A similar plaque, at higher magnification is illustrated in figure 7. Hematoxylin and eosin. x 4.

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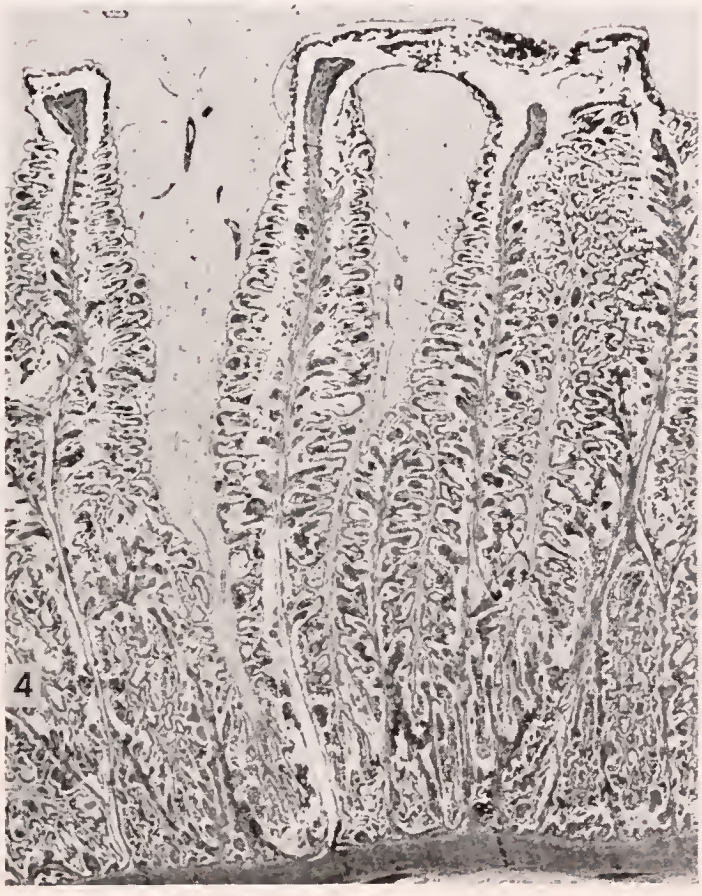

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PLATE 2

PLATE 2

Fig. 7. A detailed view of an amniotic plaque projecting from the surface of the umbilical cord (fetus 23 cm.). Masson's stain. x 112.

Fig. 8. Two minute infoldings of the epithelium of the membranous chorion producing what are interpreted as being microscopic areolae. For detailed account see text. On the right hand border, a layer of detached uterine epithelium has clung to the chorionic epithelium. Stained with eosin and methylene blue. x 144.

Fig. 9. A section of a typical cotyledon (fetus 23 cm.) cut horizontally, illustrating the relatively thick, voluminous chorionic villi lodged within a succession of uterine crypts. The coarse, primary chorionic villi have minute secondary villi projecting from their surfaces. Stained with eosin and methylene blue. x 24.

Fig. 10. A section of a typical cotyledon (fetus 23 cm.) cut perpendicularly, showing a primary villus with numerous leaf-like secondary villi protruding from it. The area is situated towards the maternal base of the cotyledon at a point where the primary villus has tapered down very considerably. The rectangle introduced into the figure outlines a field shown at higher magnification in figure 11. On the right and left hand borders of the photograph, the walls of a uterine crypt are visible giving rise to secondary folds of endometrium which interdigitate with the leaf-like secondary chorionic villi. Masson's stain. x 187.

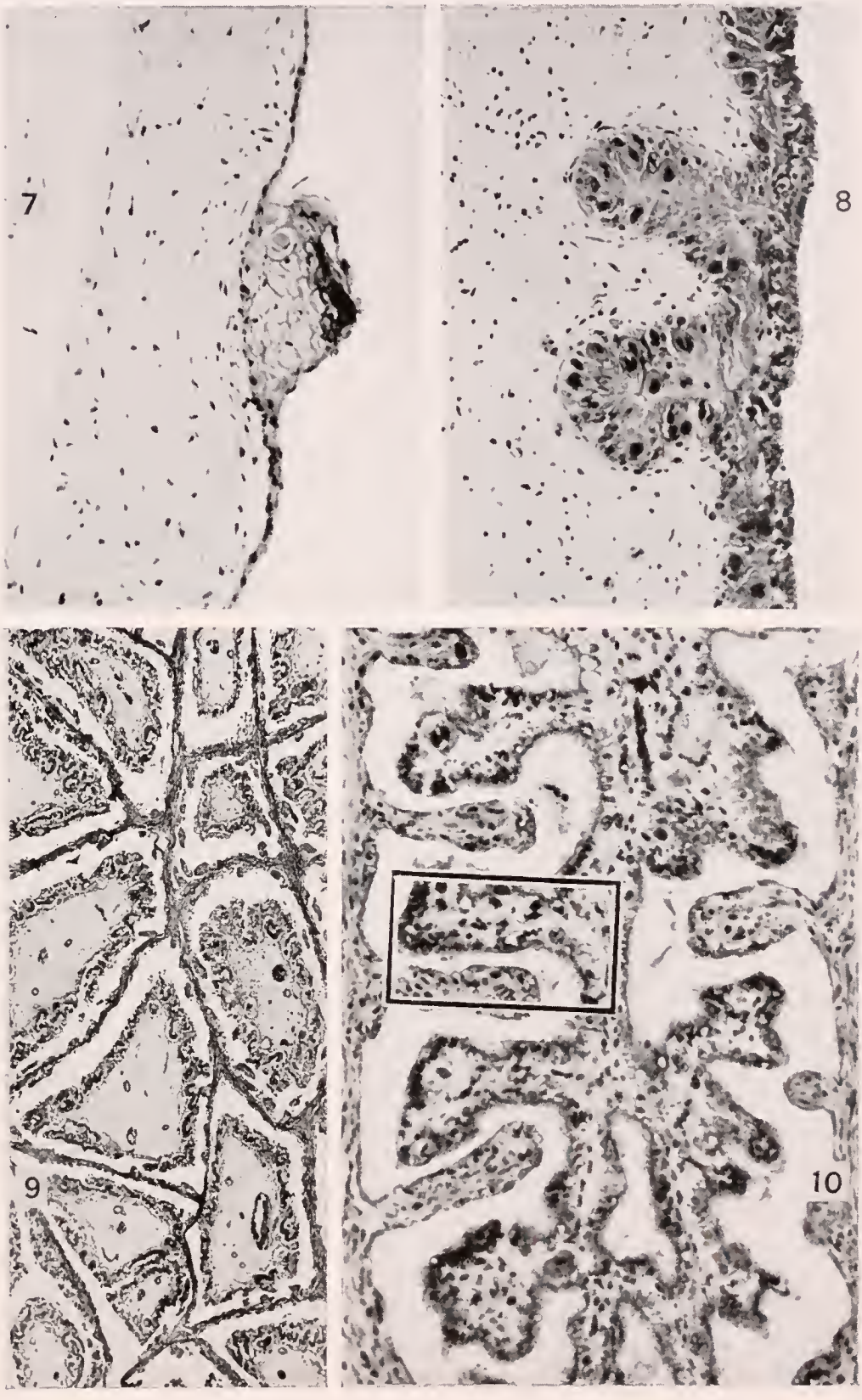
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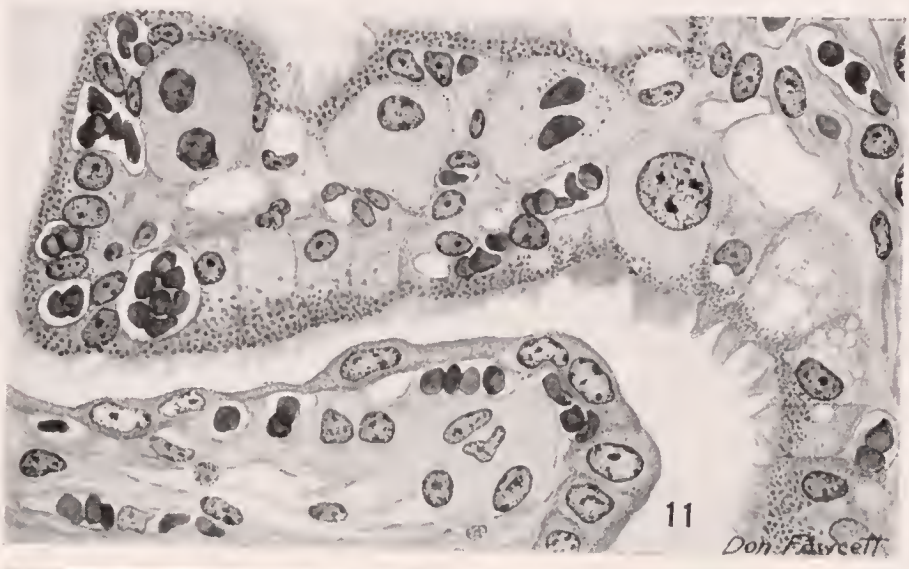
PLATE 3

PLATE 3

Fig. 11. A drawing of the area contained in the rectangle shown in figure 10. Here, many details of the secondary chorionic villi and of the uterine mucosa are discernible. A secondary chorionic villus (above) slopes down to a fossa on the right, while below it, separated by uterine lumen, is a bit of uterine mucosa. In the chorionic villus intraepithelial capillaries and giant cells are present, while in the fossa, low columnar cells bearing a heavy brush border are visible. The uterine mucosa is covered by a layer of syncytial epithelium of irregular thickness. For further details consult text. Masson's stain. Camera lucida. Ocular x 5. Obj. x 78.

Fig. 12. Photograph of three cotyledons in which the fetal chorionic villi have been pulled out of the uterine crypts. Above are 3 shaggy, dark red, vascular masses of chorionic villi corresponding to the 3 pitted maternal carunculae visible below. x $1^1/_5$.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